WARNING

The location and orientation of the cooling tower can affect the safety of those responsible for installing, servicing or reparing the cooling tower. Since SPX does not dictate or determine where the tower is located or how iti is oriented, SPX is not responsible for addressing the safety issues that are affected by the tower's location location and orientation. The following safety issues should be considered by those responsible for designing and maintaining the tower installation. Failure to consider and address these issues may result in substantial personal injury or death to those installing, servicing or repairing the cooling tower.

* Access to and from the fan deck.
* Access to and from maintenance access doors.
* Access for cleaning and other service.
* Potential access problems due to obstructions surrounding the tower.
* The possible need for safety cages around ladders.

These are only some of the safety issues that may arise in the design process. SPX strongly recommends that you consult a safety engineer to be sure that all safety considerations have been addressed.

CONFIDENTIAL - The contents of this document are confidential and constitute the exclusive property of SPX Cooling Technologies and is intended for use in the construction (contractor) and maintenance (owner) of this cooling tower. This document and its contents may not be made public in any manner, distributed or loaned to others, or repoduced or copied either in whole or part without prior written consent of SPX Cooling Technologies.

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GETTING STARTED

ABOUT THIS MANUAL
MEASUREMENT SYSTEM
TOOLS AND SUPPLIES
JOINT SEALING INSTRUCTIONS
A FEW WORDS ABOUT FASTENERS
GENERAL DECAL INSTRUCTIONS

STANDARD FIELD DETAILS

MODULE CONNECTION DETAILS (NC8411 THRU NC 8414 ONLY)
FAN GUARD
VELOCITY RECOVERY STACK
BASIC INLET PIPING
INLET PIPING WITH OPTIONAL HC VALVES
SINGLE INLET PIPING OPTION
OVERFLOW & DRAIN

FIELD INSTALLED OPTIONS

SUMP
BOTTOM OUTLET
BOTTOM OUTLET SCREEN
SCREEN WITH ANTI-VORTEX PLATE
FLUME
WEIR GATE
FLOAT VALVE FLOAT
STANDPIPE FLOAT VALVE
ELECTRIC BASIN HEATERS
EXTERNAL VIBRATION SWITCH
MOTOR OUTSIDE AIRSTREAM (MOA)
FIELD INSTALLED MOTOR

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ABOUT THIS MANUAL

To obtain maximum efficiency, it is strongly recommended that this entire manual be read before starting assembly. This assembly manual illustrates the field installation of standard and optional items that your tower may have. Due to shipping limitations these items can not be installed in the factory. Review all manuals, drawings, and bills of material prior to assembly. Contact your SPX Cooling Technologies sales representative should questions arise.
All steel parts are tagged for identification, as shown below.

Find Number: This is a three digit alpha/numeric number that ties everything together. Used throughout this manual, in the text, it's the number in bol type M35, in the figures, it's the number within the circle. It is also the first column in the BILL OF MATERIAL. In the bill of material, all tower hardware components are listed in numerical order by this number.
Item Number: This number is used by SPX to manufacture and inventory the components of your cooling tower. Give this number to your SPX sales representative if an item is missing or a replacement item is required.
Drawing Number: (Reference only) This is the number of the drawing used to fabricate this item.
Description: (Reference Only) All steel parts begin with SHEET or ASSEMBLY followed by the size of the sheet used to fabricate the item or a description of the assembly. Your tower may have a few fiberglass items which begin GRP.
Stainless Steel: This indicates when an item has been made from stainless steel. If the item is made from the standard galvanized material this will not be printed on the tag.

Bills of material (BOM) are separate from drawings and this manual. At the top of each bill there is a Drawing Number and the drawing description which indicates if the items on that bill will be installed per this assembly manual or per a special installation drawing.
The find number, item number, description and quantity of items are all cross referenced on the bill of the material. If a number is missing or hard to read, check the illustrations in this assembly manual first and then the bill of material to see if you can find it. As the tower is prepared for assembly, the quantities of each item should be checked against the bill of material.

NEED HELP!

If anything is missing, damaged, or you need help of any kind, contact your SPX Cooling Technologies Representative as soon as possible. If you need help determining the representative in your area, please call us at 1-800-4MARLEY, or check the internet at www.spxcooling.com

MEASUREMENT SYSTEM

The manual uses both, the English System and Metric System of measurement. All units are in millimeters. Fasteners are denoted in both the English and metric systems. Fasteners are supplied in conformance with the metric system standard unless otherwise noted in the tower bills of material.

TOOLS AND SUPPLIES

Hoist: 2500 (1140kg) pound capacity. For hoisting of motor on towers with field installed motors or MOA.

1/2" electric drill and bit set.

Socket wrench set: Tower mainly uses 13mm, 19mm & 30mm sockets. Have more than one if possible.

Combination wrenches: Mainly 13mm up to 30mm. Adjustable wrenches are OK but not recommended.

Screwdrivers:

Torque wrench: 150 ft lb (203 N-m) capacity.

Caulking guns: Required for application of sealant.

Pipe Wrenches:

Small and large drift pins: (alignment tools) These are extremely important to help line up all the holes. You should have more than one.

Allen wrenches:

Protractor level: For setting fand blade pitch.

Dial Indicator kit: Marley Item No. 115311M. For drive shaft alignment. Needed for motor outside airstream option only.

Scaffolding, portable stairs or other means of temporary access and support.

Impact wrenches (electric or pneumatic) with standard and deep sockets: used to tighten all hardware.

Acetone solvent: About a gallon (4 liters) and clean cotton rags.

Wear protective clothing, gloves, nonslip footwear, hard hat and safety glasses. Fluid Coolers are constructed of steel and could have burrs that can cause cuts. The surface of the steel could be slick. Protection from thrown, or falling objects should be used at all times around a construction site.

JOINT SEALING INSTRUCTIONS

Surface preparation instructions:

*The following information covering surface preparation applies to all sealed joints whether sealer **Z11** or strip sealer **Z12** or **Z13** is bein used. Years of experience has shown the instructions on surface preparation and sealing details do result in watertight joints. Inadequate attention to these details will result in joints that leak.*

Do not apply either sealer if temperature is below 40°Fahrenheit (5°Celcius).

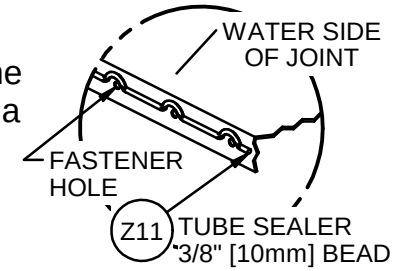
All flanges are to be straight. Rework kinks or bends that exist. Clean surfaces being sealed with acetone. If cloth is used, it must always be clean and dry. **Excercise caution in using solvents, always read labels and instructions.** Care should be taken *not* to wipe dirt or oil onto the cleaned surface from adjacent uncleaned area. Mating surfaces to be sealed must be kept clean and dry prior to assembly. No water, grease or dirt should contaminate cleaned area. Note that stainless steel requires a larger area to be cleaned because oil will recontaminate surfaces quickly. Oil will migrate through punched holes and around sheared edges.

Application instructions for Sealer Z11 (Type A, B, & C seals):

Sealer **Z11** comes in a 1/12th gallon (315ml) cartridge and is applied using a standard caulking gun. Apply sealer to the unassembled parts. The typical joint sealing details shown on this page and the following page are referenced throughout this manual. Care should be taken to fill voids and gaps at joints. After parts have been assembled, trowel excess sealant over joint, taking care to force sealant back into joint, and not out of joint. *Do not use solvent to aid in applying sealer as solvent adversely affects bonding of sealant to metal. Care should be taken to avoid leaving holes or air bubbles in sealant.*

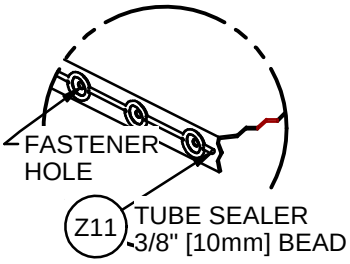
Do not subject sealed joints to waterloading for 48 hours at temperatures of 70°Fahrenheit (21°Celci us) and above. Lower temperature will require a longer cure time.

This symbol is used throughout the manual to indicate the locations where sealer **Z11** is required. The "A" refers to a "Type 'A' Seal" which is a 3/8" (10mm) diameter bead of sealer **Z11** laid along the centerline of a row of holes curving over each hole as it passes. Reference detail at the right.



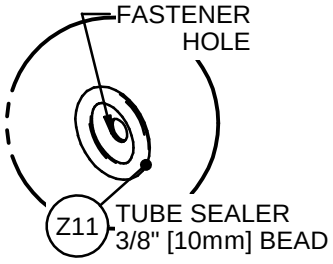
TYPE A SEAL

This symbol is used throughout the manual to indicate the locations where sealer **Z11** is required. The "B" refers to a "Type 'B' Seal" which is a 3/8" (10mm) diameter bead of sealer **Z11** laid along the centerline of a row of holes curving completely around each hole as it passes. Reference detail at the right.



TYPE B SEAL

This symbol is used throughout the manual to indicate the locations where sealer **Z11** is required. The "C" refers to a "Type 'C' Seal" which is a 3/8" (10mm) diameter bead of sealer **Z11** laid completely around each hole in a row of holes. Reference detail at the right.

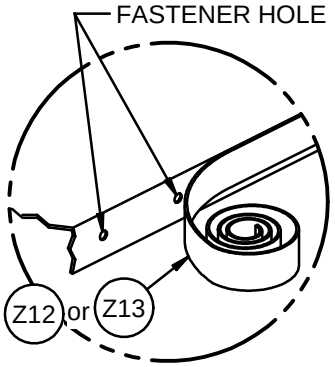


TYPE C SEAL

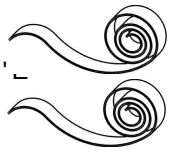
PRELIMINARY

Application instructions for Strip Sealer Z12 & Z13 (Type D, E & F seals):
Strip sealer is supplied in 1/2" (12mm) **Z13** and 1" (25mm) **Z12** widths. It is intended that the 1" (25mm) wide sealer be used unless otherwise noted.
Apply *continuous* pieces of strip sealer to the unassembled parts. *Do not splice pieces except where turning a corner. Cut with a sharp instrument, do not stretch or tear.*
Gaps at joints and corners can be filled by stretching a piece of strip sealer to obtain the proper thickness. Then work it into the joint to fill the gap and create an even surface.
After parts are set together, use a drift pin or other pointed object to puncture sealer at each fastener hole, where required.

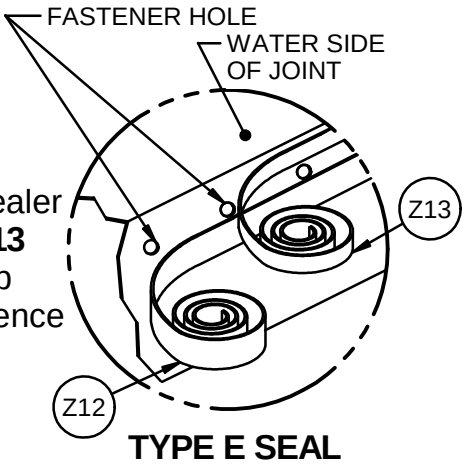
This symbol is used throughout the manual to indicate the locations where a single layer of strip sealer **Z12** or **Z13** is required. Reference detail at the right.



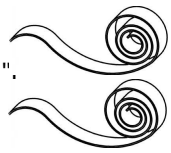
TYPE D SEAL



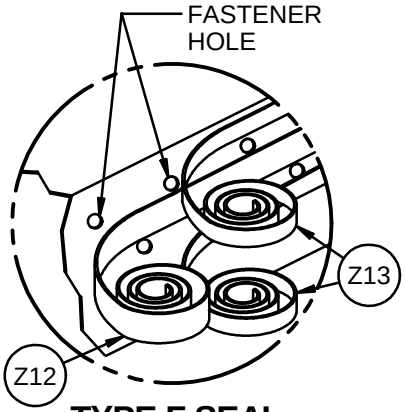
This symbol is used on collection basin joints to indicate the locations where two layers of strip sealer are required. Align bottom edge of strip sealer **Z13** with top edge of bolt holes. Align top edge of strip sealer **Z12** with bottom edge of bolt holes. Reference detail at the right.



TYPE E SEAL



This symbol is used on distribution basin joints to indicate the locations where two layers of strip sealer are required. Align bottom edge of first strip sealer **Z13** with top edge of bolt holes. Align top edge of second strip sealer **Z13** with bottom edge of bolt holes. Reference detail at the right.



TYPE F SEAL

A FEW WORDS ABOUT FASTENERS

Stainless Steel Fasteners:
Stainless steel fasteners are prone to galling. This is when you notice a sudden increase in the force needed to turn a nut before parts are clamped. Apply anti-seize compound to the threads of the bolt before installing the nut. If a nut does not easily spin on a bolt, do not try to force it. Chances are it will seize. Some extra hardware is included to replace problem hardware.

This manual depicts flanged-head fasteners. On stainless steel towers these connection points will consist of a regular hex-head bolt and two washers in place of the flange-head bolt.

Tap Screw Repair:
During installation of tap screws in sheet metal parts, tap screws may strip, not allowing the screw to be fully tightened. if this occurs, place a 3/8" [10mm] nut on the back side of the tap screw and tighten.

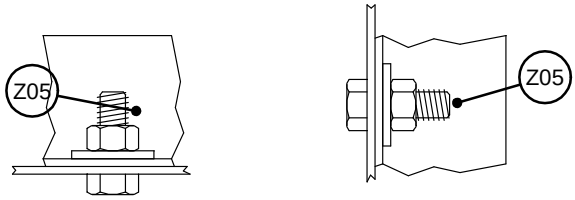
Torque requirements:
The idealized standard fastener torque values for galvanized and stainless steel fasteners are shown in the table below. These values may vary in actual practice. Note that the values shown for stainless steel fasteners are based on the fasteners being lubricated with anti-seize compound.

FASTENER TORQUE		
BOLT DIAMETER	FASTENER TORQUE FOOT-LBS. (NEWTON-METERS)	
	GALVANIZED	* STAINLESS STEEL
8mm	20 (27.1)	20 (27.1)
10mm	20 (27.1)	20 (27.1)
12mm	45 (61)	27 (37)
16mm	90 (122)	44 (60)
20mm	150 (203)	74 (100)

** Values based on fasteners lubricated with anti-seize compund. (Stainless steel only)*

Loctite®
Critical structural and mechanical attachments require extra protection against the nuts vibrating loose during tower operation. This is accomplished on galvanized fasteners by applying Loctite, **Z05**, thread locking compound to the exposed threads of a bolt after the nut has been installed and tightened. Bolts should be installed with the threaded end up or horizontally. Reference details below. *On stainless steel fasteners the use of anti-seize compound makes the use of loctite ineffective. Therefore in these critical areas with stainless steel fasteners, self-locking nuts have been substituted for the standard nuts and loctite will not be used.*

This symbol is used throughout the manual to indicate the locations where Loctite **Z05** is required. Reference details at the right.



Typical bolted attachment with threaded end of bolt up, or installed horizontally

GENERAL DECAL INSTRUCTIONS

Decals are an important part of the tower assembly. Decals provide instructions, identifications, cautions and warnings deemed necessary for proper operation and safety.

Surface Preparation

Surface must be clean and dry. Oil and dirt may be removed with solvent (such as acetone) or commercial detergent. Wash the area with warm water and dry with a lint-free cloth. Ultimate adhesion will occur 24-28 hours after application should not be undertaken if temperature is below 35 degrees Fahrenheit, or if humidity is greater than 95%.

General Application Instructions

Peel off backing paper, taking care to avoid dirt contamination of the exposed adhesive. Carefully apply decal to the desired location with light pressure to avoid distortion of the vinyl. Once in position, smooth out with a towel. If air bubbles occur, puncture with a pin and smooth down with a towel. The finished decal should be completely flat.

NOTES

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PRELIMINARY

MODULE CONNECTION DETAILS

FIND NO.	DESCRIPTION
VN3	BOLT, HF 20MM X 45MM
W05	WASHER, LOCK, M20
X64	NUT, HF M20

NC8411 thru NC8414 only

Before top module is hoisted into place on bottom module, clean any dirt and debris from the underside of the top module skid sides and beams. Remove shipping guards from bottom of top module. After top module is in place the modules may be connected near louver columns as shown in *Figure 1*, or inside tower on eliminator face per *Figure 2*.

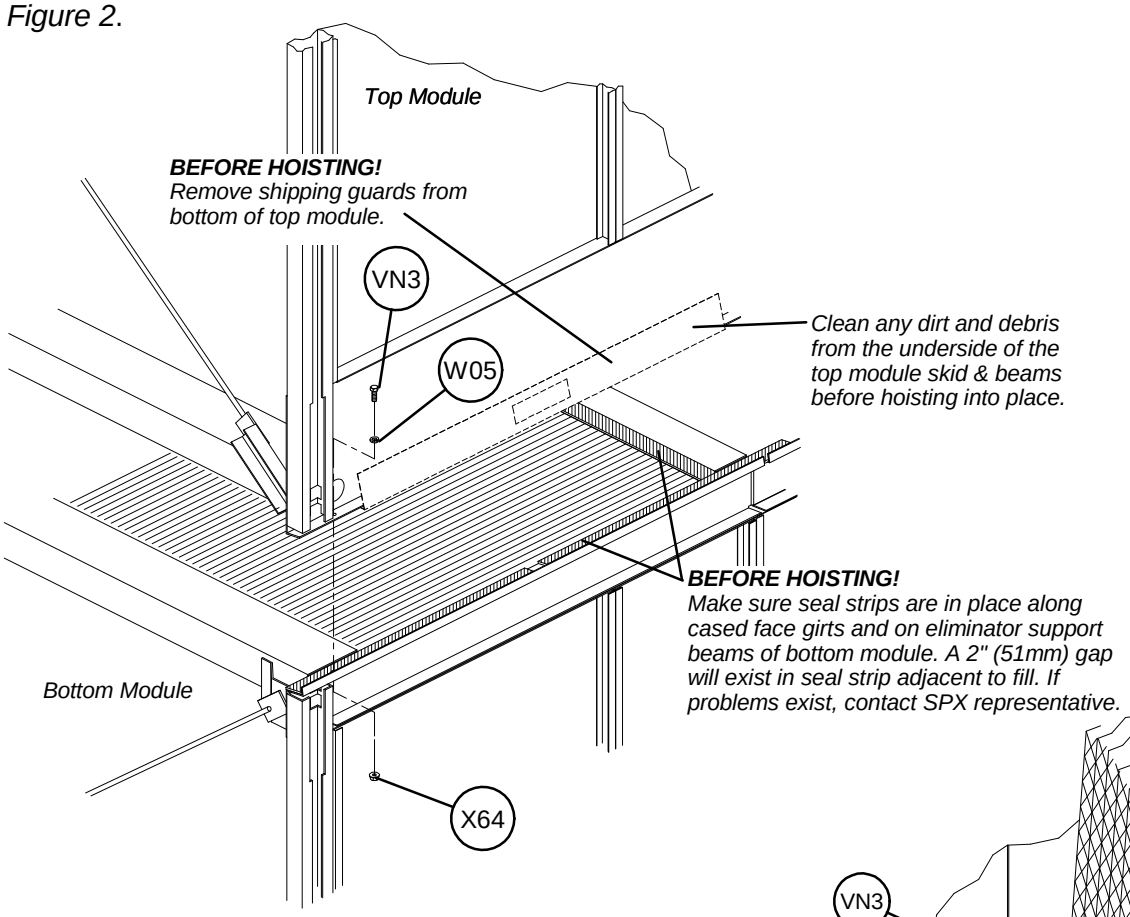

Top Module
BEFORE HOISTING!
Remove shipping guards from bottom of top module.
VN3
W05
Clean any dirt and debris from the underside of the top module skid & beams before hoisting into place.
BEFORE HOISTING!
Make sure seal strips are in place along cased face girts and on eliminator support beams of bottom module. A 2" (51mm) gap will exist in seal strip adjacent to fill. If problems exist, contact SPX representative.
Bottom Module
X64

Figure 1

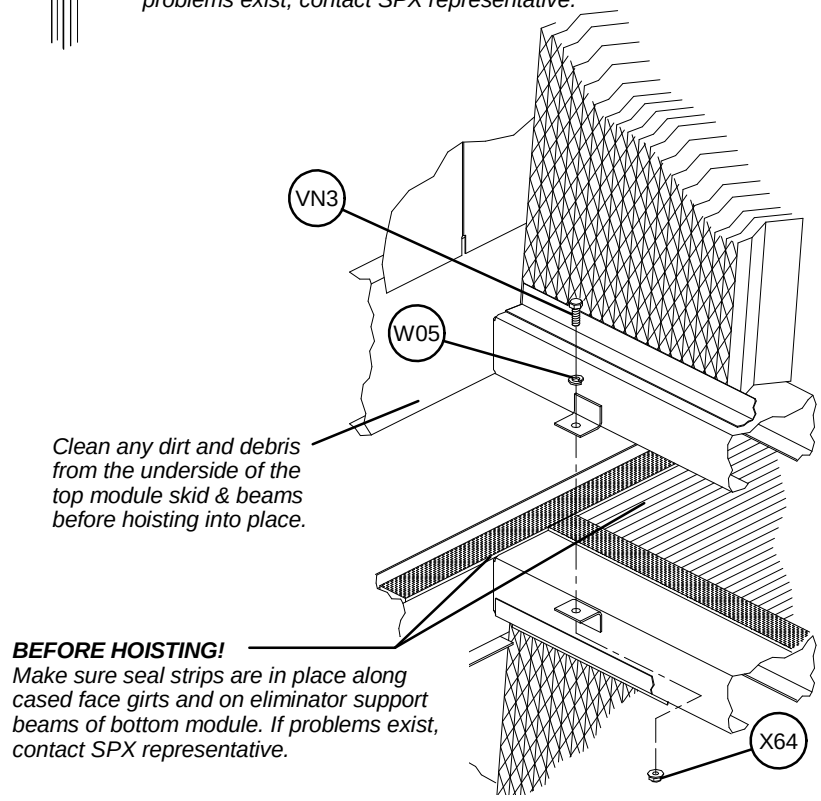
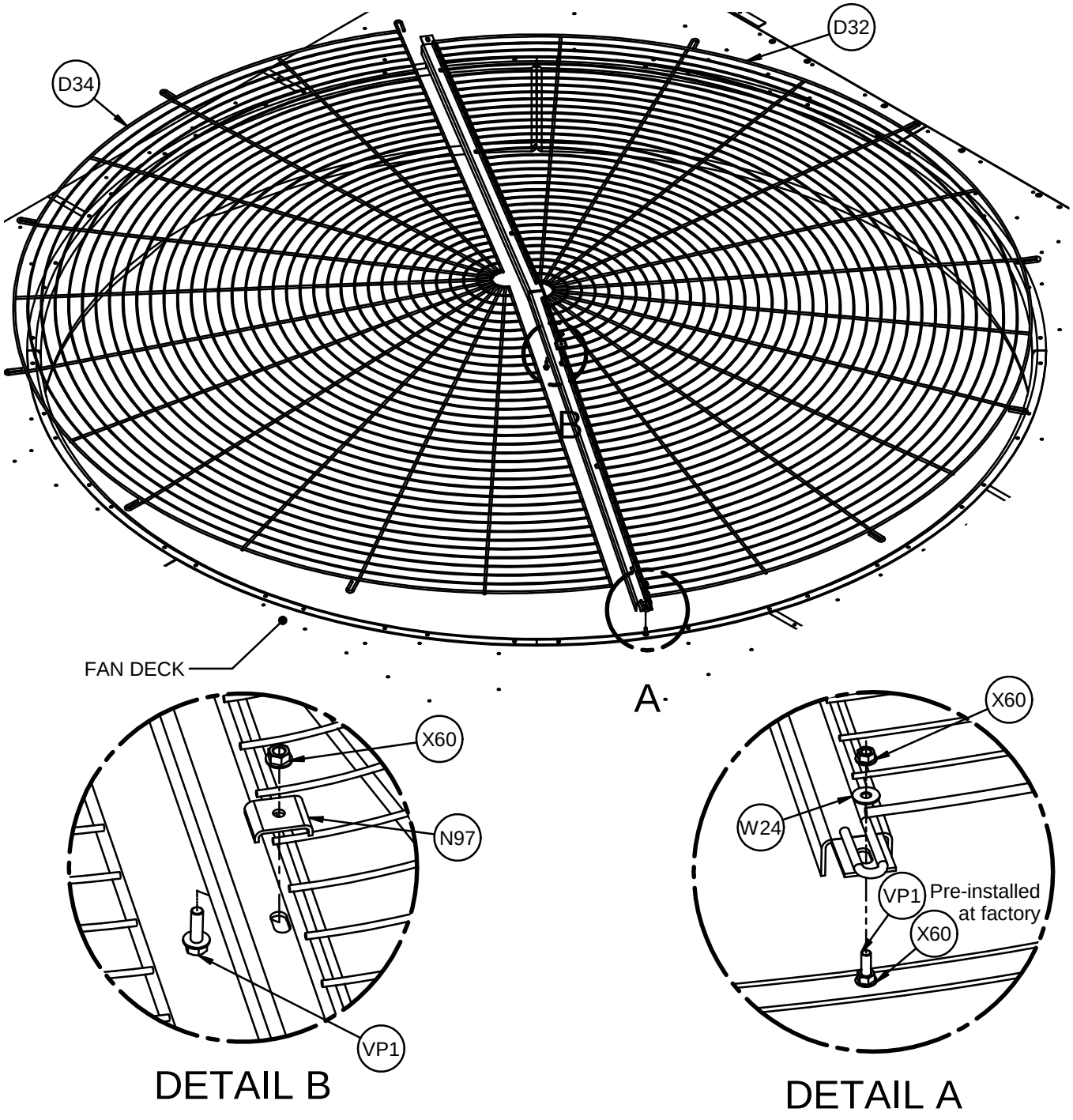

VN3
W05
Clean any dirt and debris from the underside of the top module skid & beams before hoisting into place.
BEFORE HOISTING!
Make sure seal strips are in place along cased face girts and on eliminator support beams of bottom module. If problems exist, contact SPX representative.
X64

Figure 2

PRELIMINARY

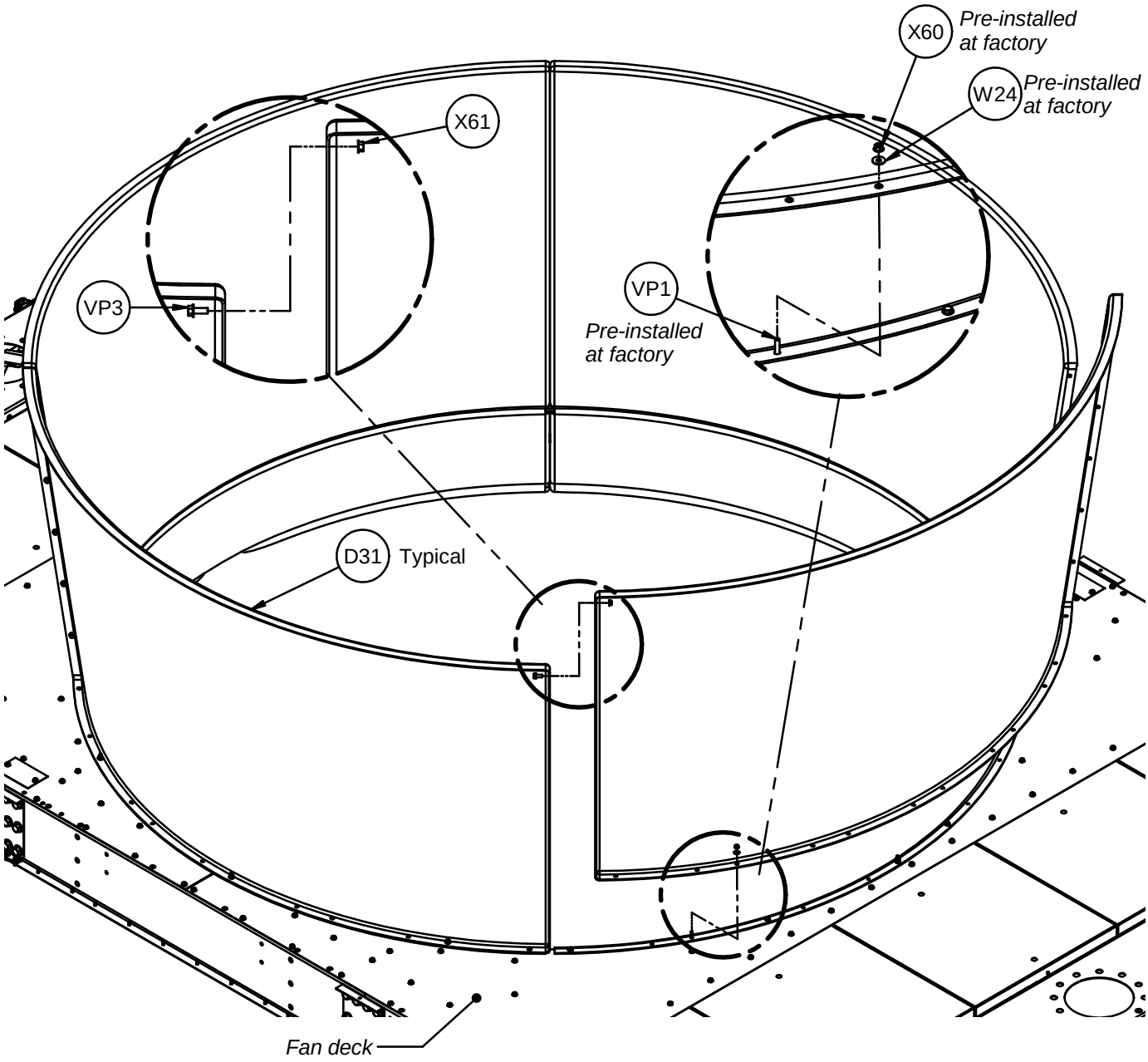


FAN GUARD

A single piece fan guard is provided on models NC8401 thru NC8403, Models NC 8405 thru NC8414 use a two piece fan guard and require guard splice hardware. On models with a single piece fan guard, position guard D34 over cylinder and raise center to align holes in fan cylinder. On models with a two piece fan guard, guard D32 is installed first and a splice clip N97 is used to retain guard D34.

FIND NO.	DESCRIPTION
VP1	BOLT, HF 8MM X 25MM
W24	WASHER, FLAT, M8
X60	NUT, HF M8

PRELIMINARY



VELOCITY RECOVERY STACK

On models with a velocity recovery stack, install fiberglass cylinder segments **D31** per *Figure 1* on top of lower cylinder that extends down from deck. Segments are to straddle tower centerline. Installation hardware for the cylinder segments has been pre-installed at the factory and must be removed prior to cylinder installation. Fan guard is not required on these models.

FIND NO.	DESCRIPTION
VP1	BOLT, HF 8MM X 40MM
VP3	BOLT, HF 10MM X 25MM
W24	WASHER, FLAT, M8
X60	NUT, HF M8
X61	NUT, HF M10

PRELIMINARY

BASIC INLET PIPING

If tower is *not* using the optional HC valves, inlet piping is attached directly to the distribution basin, see *Figure 1*. *Note that inlet piping and fasteners are supplied by others.*

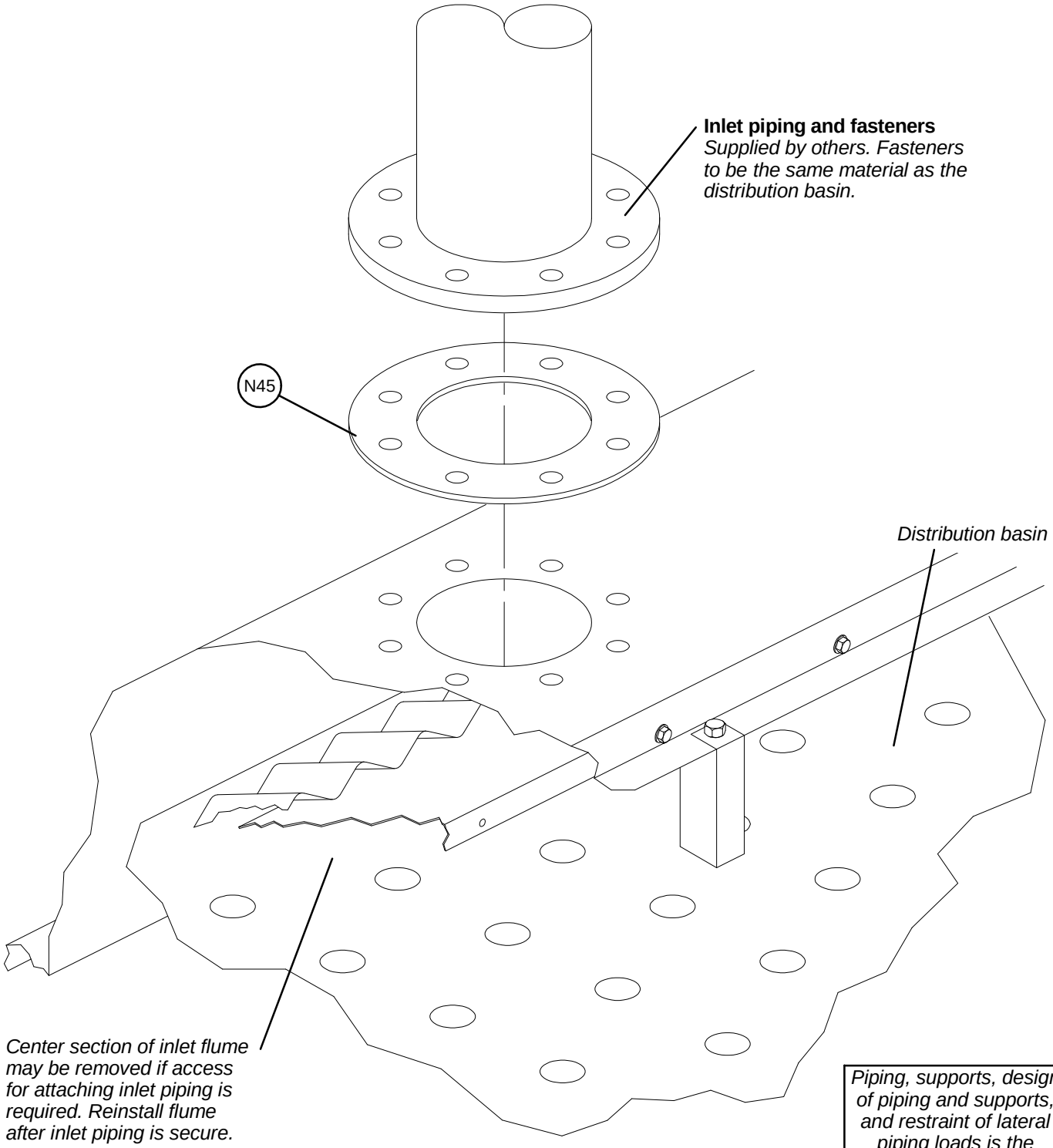
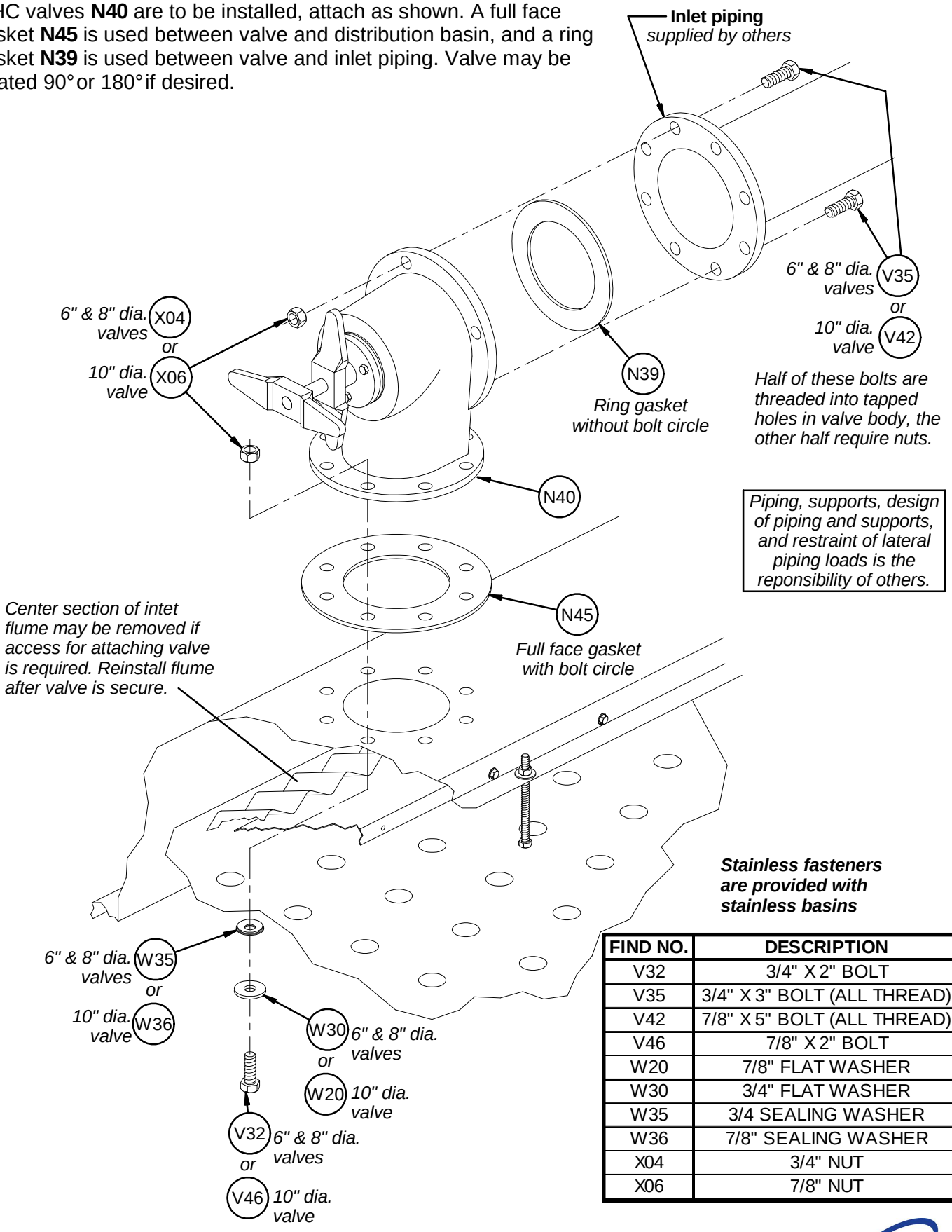

Inlet piping and fasteners
Supplied by others. Fasteners to be the same material as the distribution basin.
N45
Distribution basin
Center section of inlet flume may be removed if access for attaching inlet piping is required. Reinstall flume after inlet piping is secure.
Piping, supports, design of piping and supports, and restraint of lateral piping loads is the reponsibility of others.

Figure 1

PRELIMINARY

INLET PIPING WITH OPTIONAL HC VALVES

If HC valves **N40** are to be installed, attach as shown. A full face gasket **N45** is used between valve and distribution basin, and a ring gasket **N39** is used between valve and inlet piping. Valve may be rotated 90° or 180° if desired.



Stainless fasteners are provided with stainless basins

FIND NO.	DESCRIPTION
V32	3/4" X 2" BOLT
V35	3/4" X 3" BOLT (ALL THREAD)
V42	7/8" X 5" BOLT (ALL THREAD)
V46	7/8" X 2" BOLT
W20	7/8" FLAT WASHER
W30	3/4" FLAT WASHER
W35	3/4 SEALING WASHER
W36	7/8" SEALING WASHER
X04	3/4" NUT
X06	7/8" NUT

PRELIMINARY

SINGLE INLET PIPING OPTION

If the tower has been supplied with a single inlet option, see installation details on the following pages.

Piping, supports, design of piping and supports, and restraint of lateral piping loads is the responsibility of others.

FIND NO.	DESCRIPTION
VPN	BOLT, HF 20MM X 90MM
VPM	BOLT, HF 20MM X 80MM
X64	NUT, HF M20

Stainless fasteners are provided with stainless basins or casing.

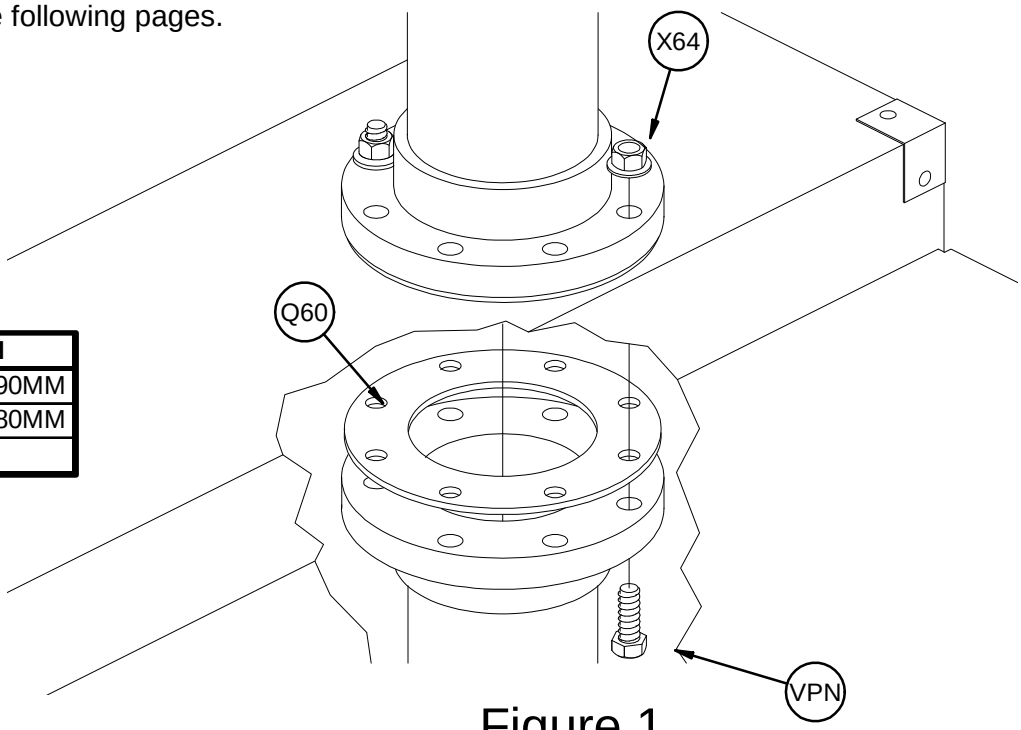


Figure 1

SINGLE BOTTOM INLET

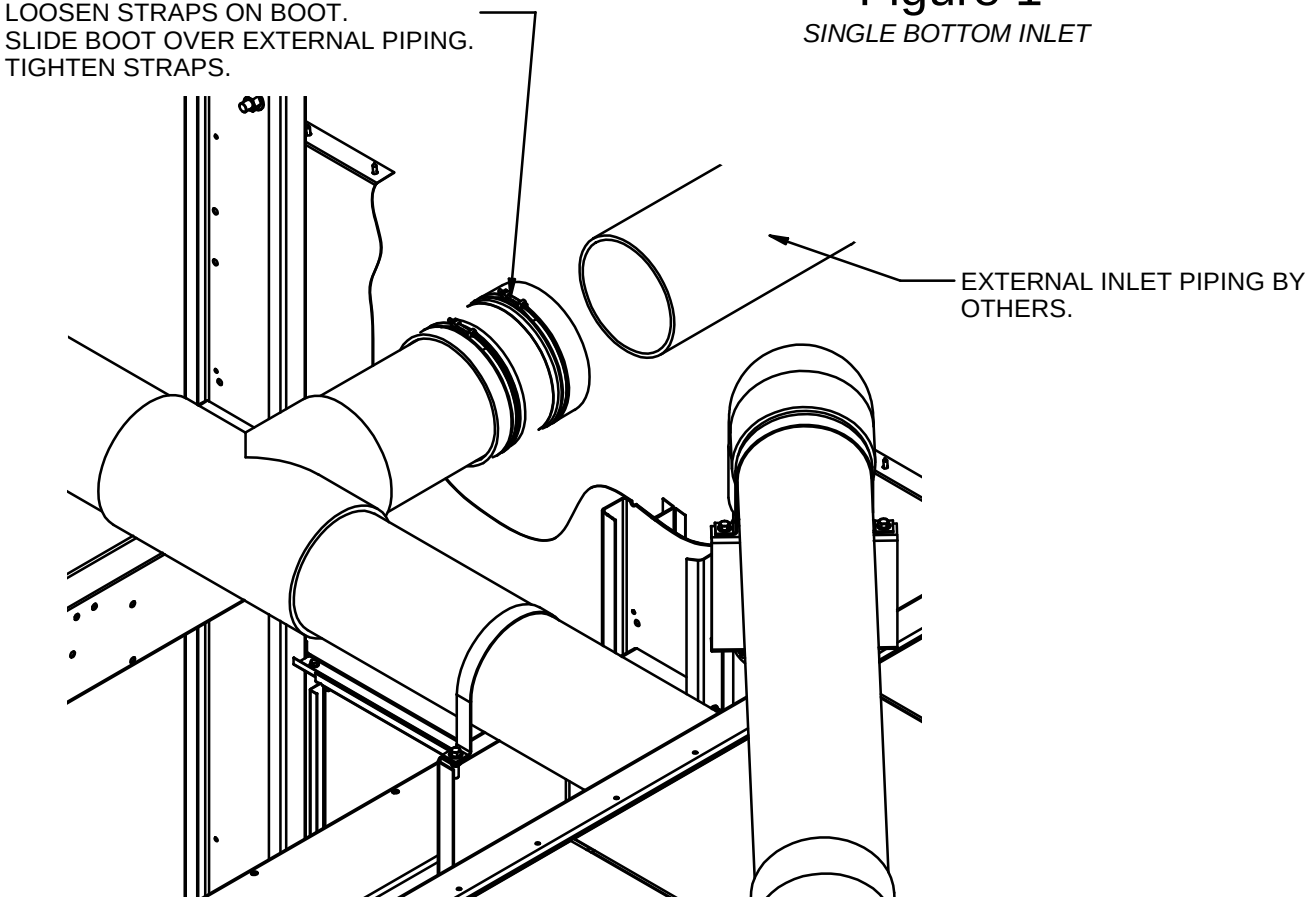


Figure 2

SINGLE SIDE INLET

PRELIMINARY

Install pipe support **Q74** on to the stud bolts protruding from the fan deck as shown below. Prior to installation of Single Inlet fan deck piping **Q63** or **Q64**, clean outside of pipe and inside rubber boot protruding from the fan deck. Then apply a thin layer of sealer **Z11** to inside of rubber boot. Install the fan deck pipe into boot so that it butts with the interior pipe and align the flanged end with the hot water basin inlet along with gasket **Q66**. When installed, the fan deck piping should be level in relation to the fan deck. Finally, attach pipe support strap **Q81** to pipe support as shown.

FIND NO.	DESCRIPTION
VP7	BOLT, HF 12MM X 25MM
VPM	BOLT, HF 20MM X 80MM
X62	NUT, HF M12
X64	NUT, HF M20

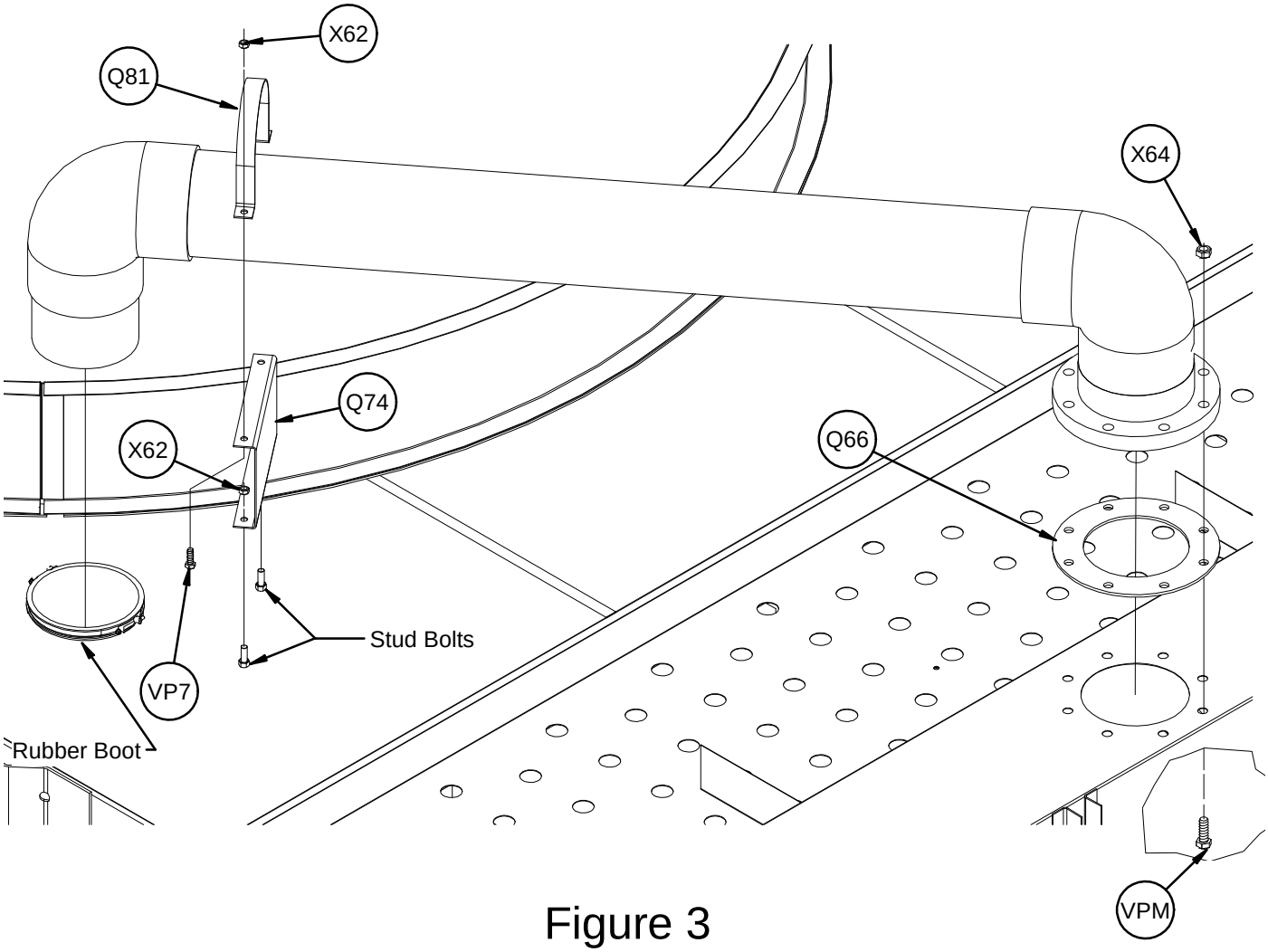


Figure 3

SINGLE INLET FAN DECK PIPING

PRELIMINARY

Models NC8411 thru NC8414 with the Single Bottom Inlet Option require the installation of a rubber boot coupling between the piping of the top and bottom tower modules.

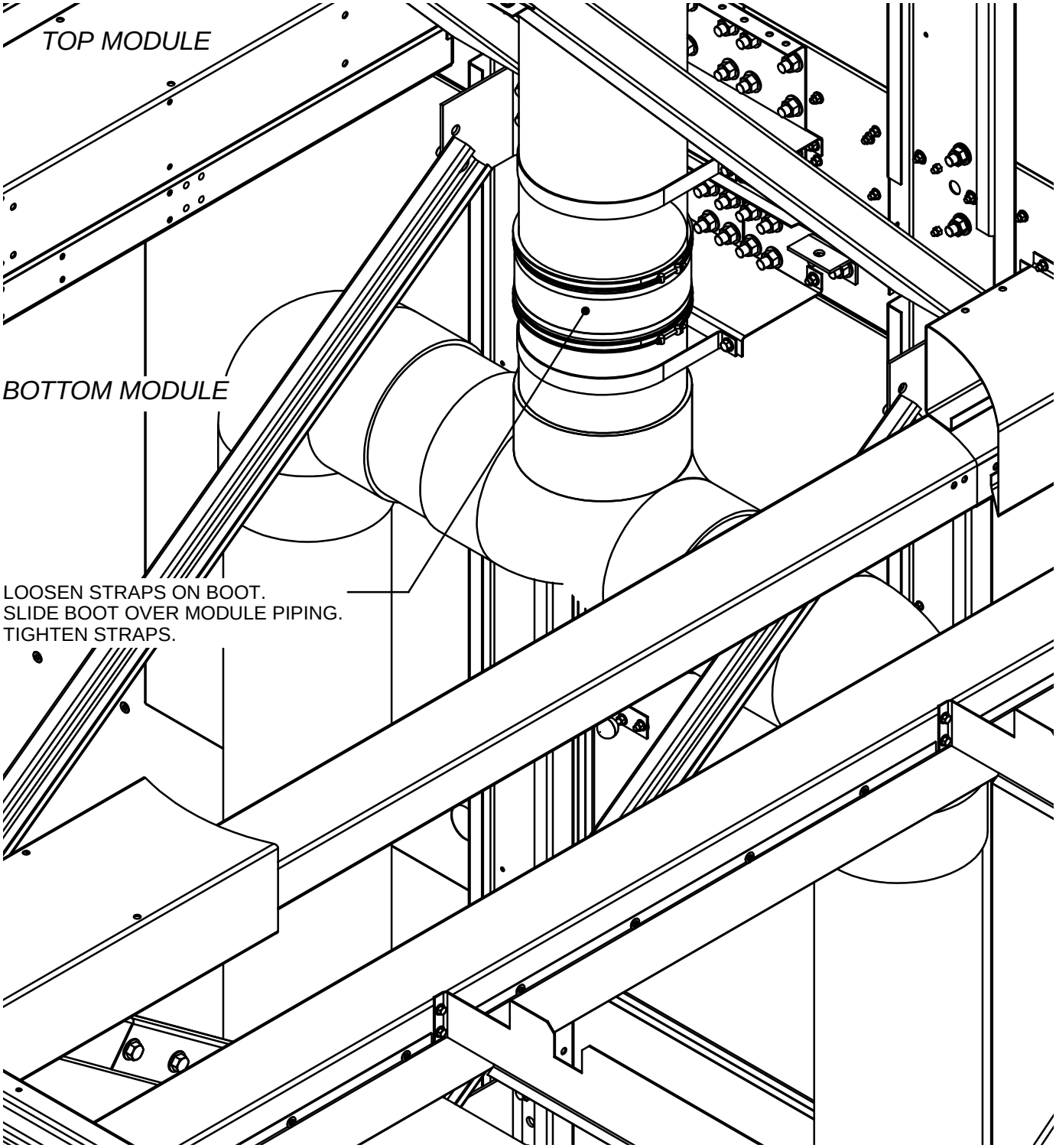


Figure 4

SINGLE BOTTOM INLET
NC8411 thru NC8414 Only

PRELIMINARY

OVERFLOW & DRAIN

All towers must have an overflow and drain, either as the standpipe in the collection basin floor or at the optional coverplate location. The standpipe overflow and drain is installed per *Figure 1*. Bolt coupling assembly **Q47** to bottom of the collection basin floor at the 6" (152mm) diameter hole and bolt pattern. Install standpipe **Q48**. The standpipe is PVC unless and optional heater element is close by, then a steel standpipe will be installed with teflon tape (supplied by others) to protect the threads.

If the optional coverplate drain and overflow is being used, the cutout in the depressed section for the standpipe has been covered with a drain polate that must have plug **Q18** installed per *Figure 2*. If coverplate drain is not being plumbed, install pipe plug **Q18** per *Figure 3*.

FIND NO.	DESCRIPTION
VP0	BOLT, HF 8MM X 25MM
W37	SEALING WASHER, M8
X60	NUT, HF M8

Stainless fasteners are provided with stainless basins

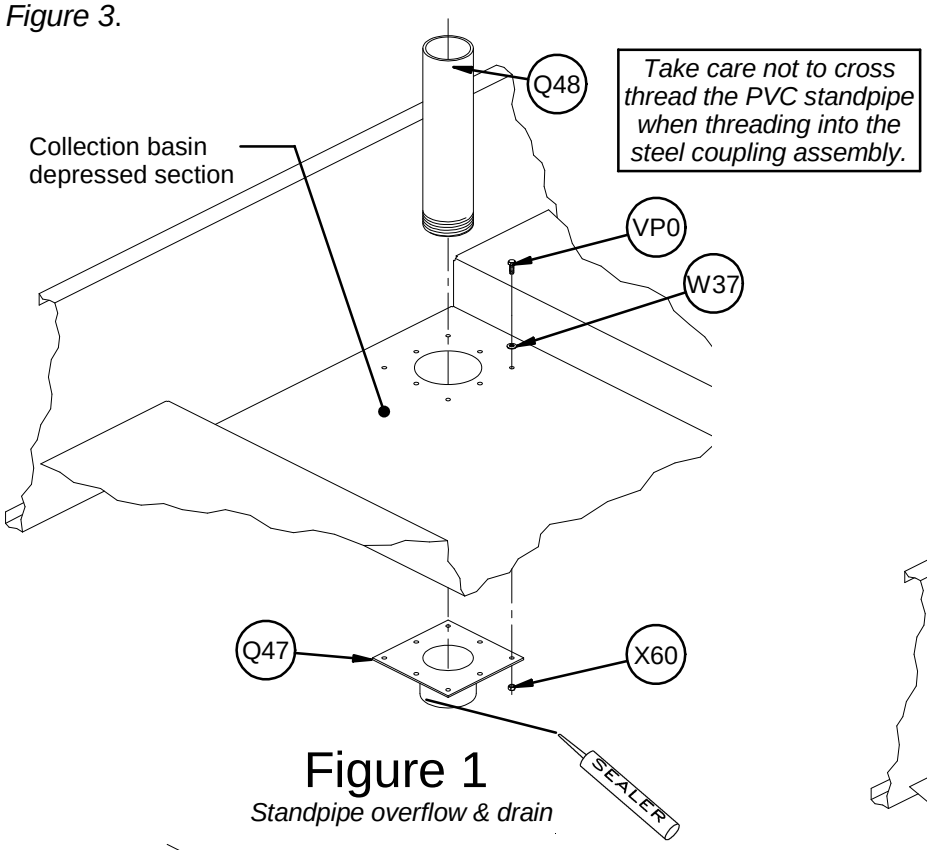


Figure 1
Standpipe overflow & drain

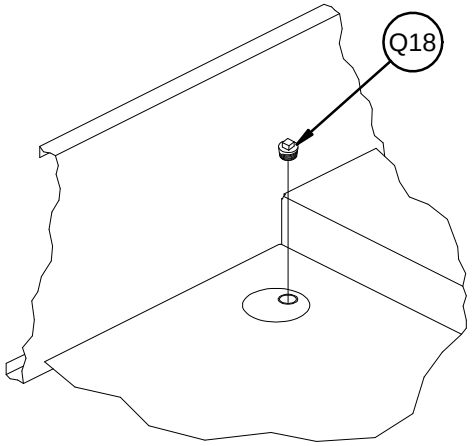


Figure 2
Floor drain plug

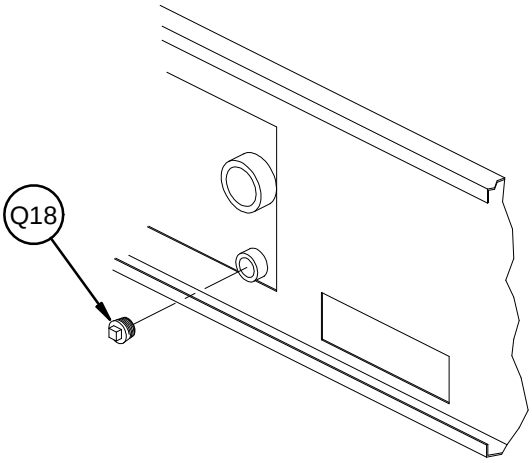


Figure 3
Coverplate drain plug

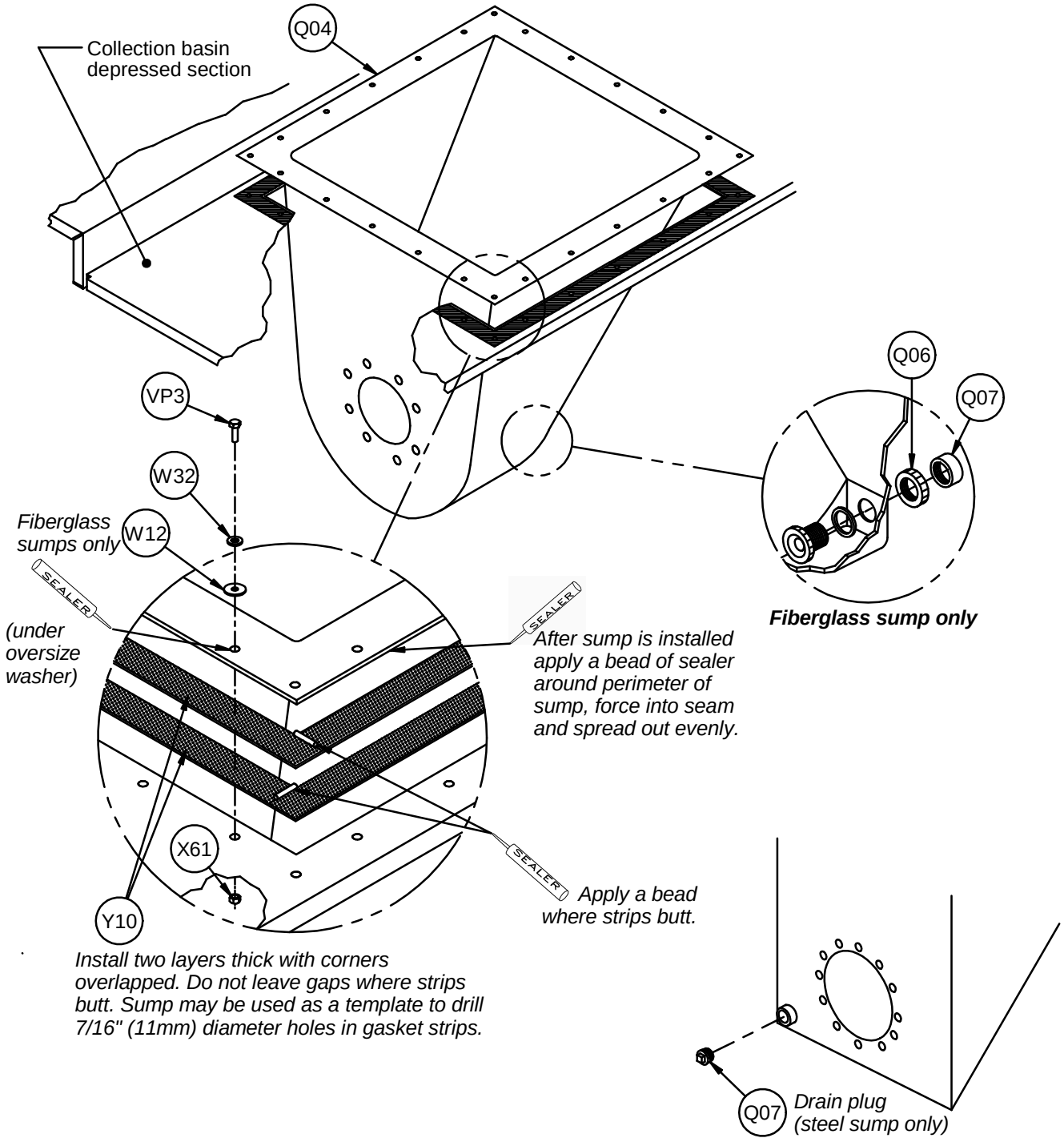
PRELIMINARY

SUMP

Sump installation is per above figures. Sump may be rotated 90° or 180° provided outlet piping will clear supporting s teel. Lay strips of gasket **Y10** around sump opening in depressed section floor. Set sump **Q04** in place and use as a template to drill 7/16" (11mm) dia. holes thru gasket. Attach sump to floor and seal around perimeter. On fiberglass sumps, install plastic tank adapter **Q06** and pipe cap **Q07** in the bottom of the sump as a drain *(on steel sumps, pipe plug Q07 is installed in the coupling in the front of the sump)*.

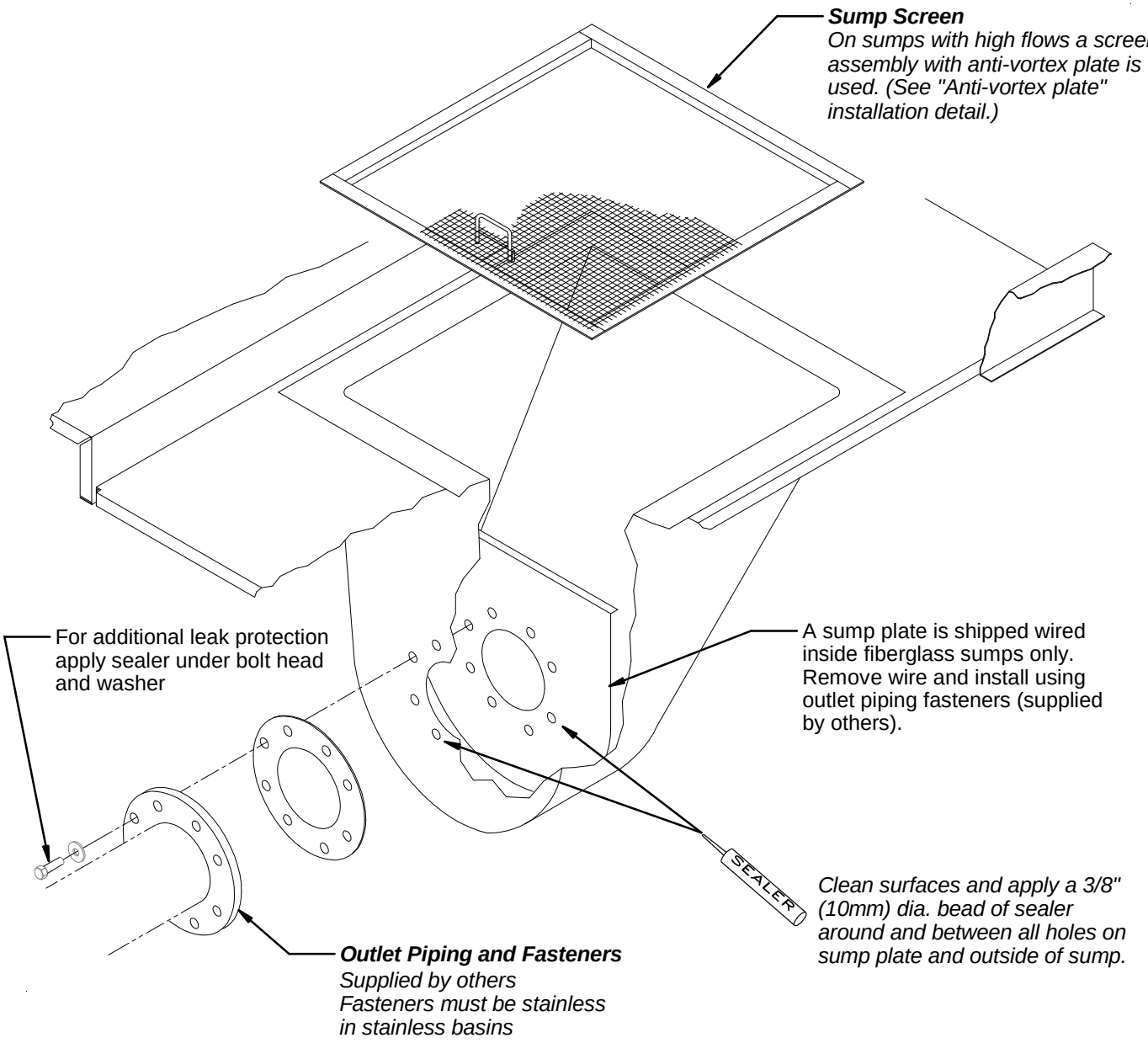
FIND NO.	DESCRIPTION
VP3	BOLT, HF 10MM X 25MM
W12	3/8" OVERSIZE WASHER
W32	SEALING WASHER - 3/8"
X61	NUT, HF M10

Stainless fasteners are provided with stainless basins


Q04
Collection basin depressed section
VP3
W32
Fiberglass sumps only
W12
SEALER
(under oversize washer)
SEALER
SEALER
X61
Y10
Q06
Q07
Fiberglass sump only
After sump is installed apply a bead of sealer around perimeter of sump, force into seam and spread out evenly.
Apply a bead where strips butt.
Install two layers thick with corners overlapped. Do not leave gaps where strips butt. Sump may be used as a template to drill 7/16" (11mm) diameter holes in gasket strips.
Q07
Drain plug (steel sump only)

PRELIMINARY

See below figure for the typical attachment of customer piping using gasket **Q14**. A sump plate is used on the inside of foberglass sumps only. After piping has been installed, set pump screen (if required) in place over the sump opening. *On sumps with higher flows, a screen assembly with anti-vortex plate is used instead of the sump screen shown. See "Anti-vortex plate" installation detail.* **The tower is not designed to support additional piping loads. DO NOT SUPPORT PIPING FROM THE TOWER.**


Sump Screen
On sumps with high flows a screen assembly with anti-vortex plate is used. (See "Anti-vortex plate" installation detail.)
For additional leak protection apply sealer under bolt head and washer
A sump plate is shipped wired inside fiberglass sumps only. Remove wire and install using outlet piping fasteners (supplied by others).
SEALER
Clean surfaces and apply a 3/8" (10mm) dia. bead of sealer around and between all holes on sump plate and outside of sump.
Outlet Piping and Fasteners
Supplied by others
Fasteners must be stainless in stainless basins

Piping, supports, design of piping and supports, and restraint of lateral piping loads is the responsibility of others.

BOTTOM OUTLET

The typical attachment of customer piping for bottom outlet or equalizer connection using gasket **Q14** is shown in *Figure 1*. **The tower is not designed to support additional piping loads. DO NOT SUPPORT PIPING FROM THE TOWER.**

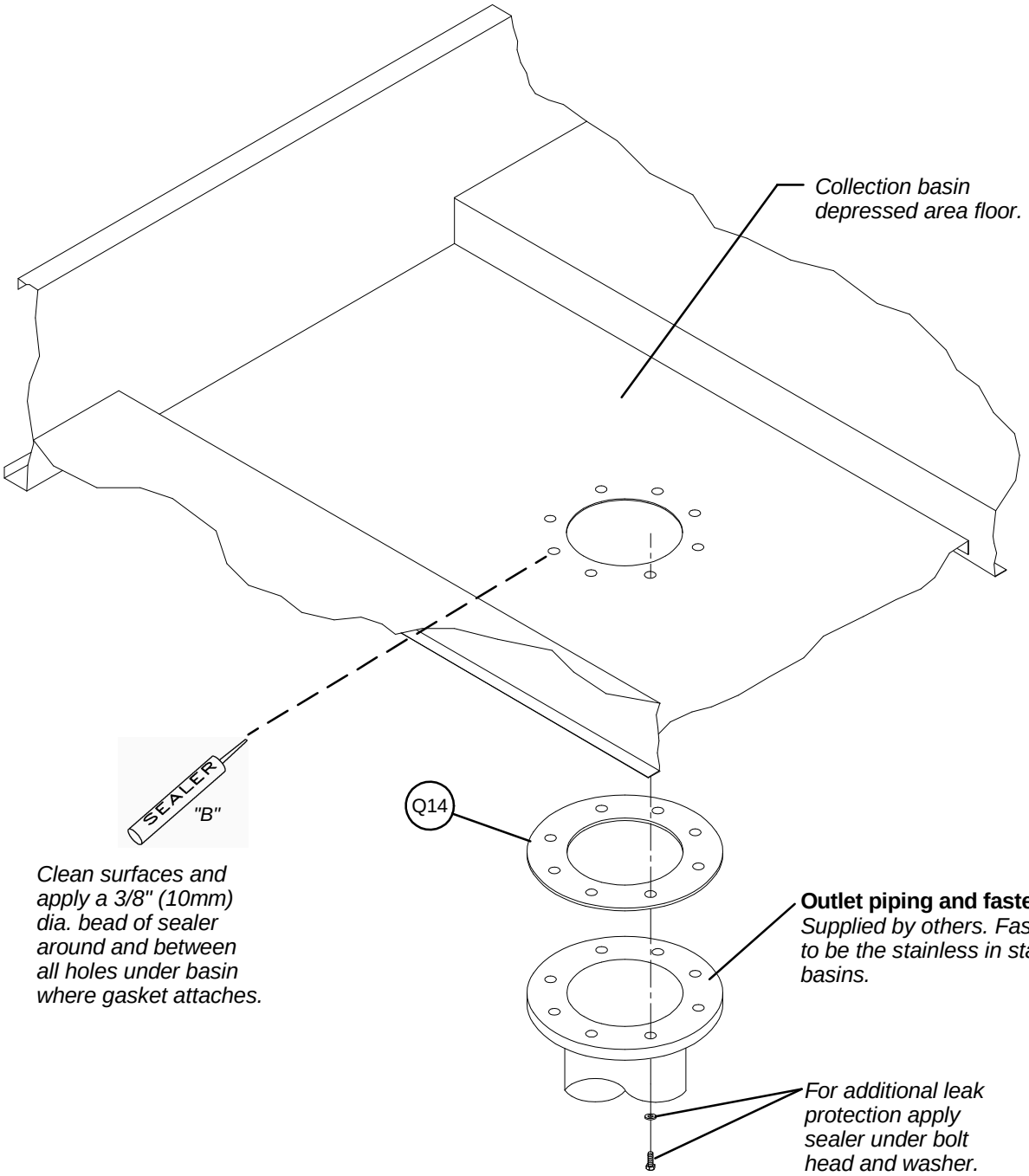

Collection basin depressed area floor.
SEALER
"B"
Q14
Clean surfaces and apply a 3/8" (10mm) dia. bead of sealer around and between all holes under basin where gasket attaches.
Outlet piping and fasteners
Supplied by others. Fasteners to be the stainless in stainless basins.
For additional leak protection apply sealer under bolt head and washer.

Figure 1

Piping, supports, design of piping and supports, and restraint of lateral piping loads is the reponsibility of others.

PRELIMINARY

BOTTOM OUTLET SCREEN

When a screen is needed with the bottom outlet, it is installed as shown in *Figure 1*. On bottom outlets with higher flows a screen assembly with anti-vortex plate is used. Se "Screen with Anti-Vortex Plate" installation detail.

Bottom Outlet Screen
For bottom outlets with high flows, a screen assembly with anti-vortex plate is used. (See "Screen with Anit-Vortex Plate" installation detail.)

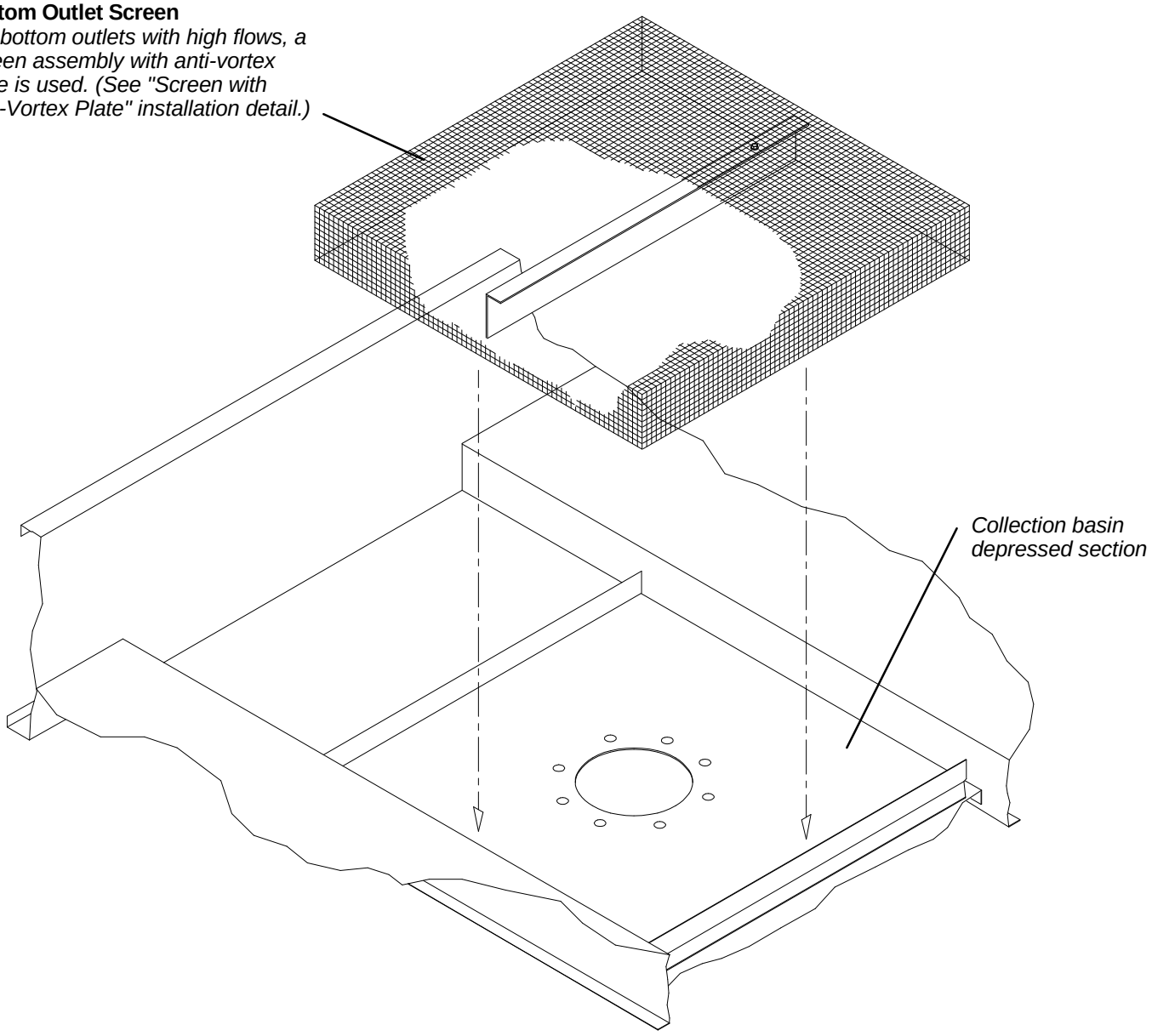


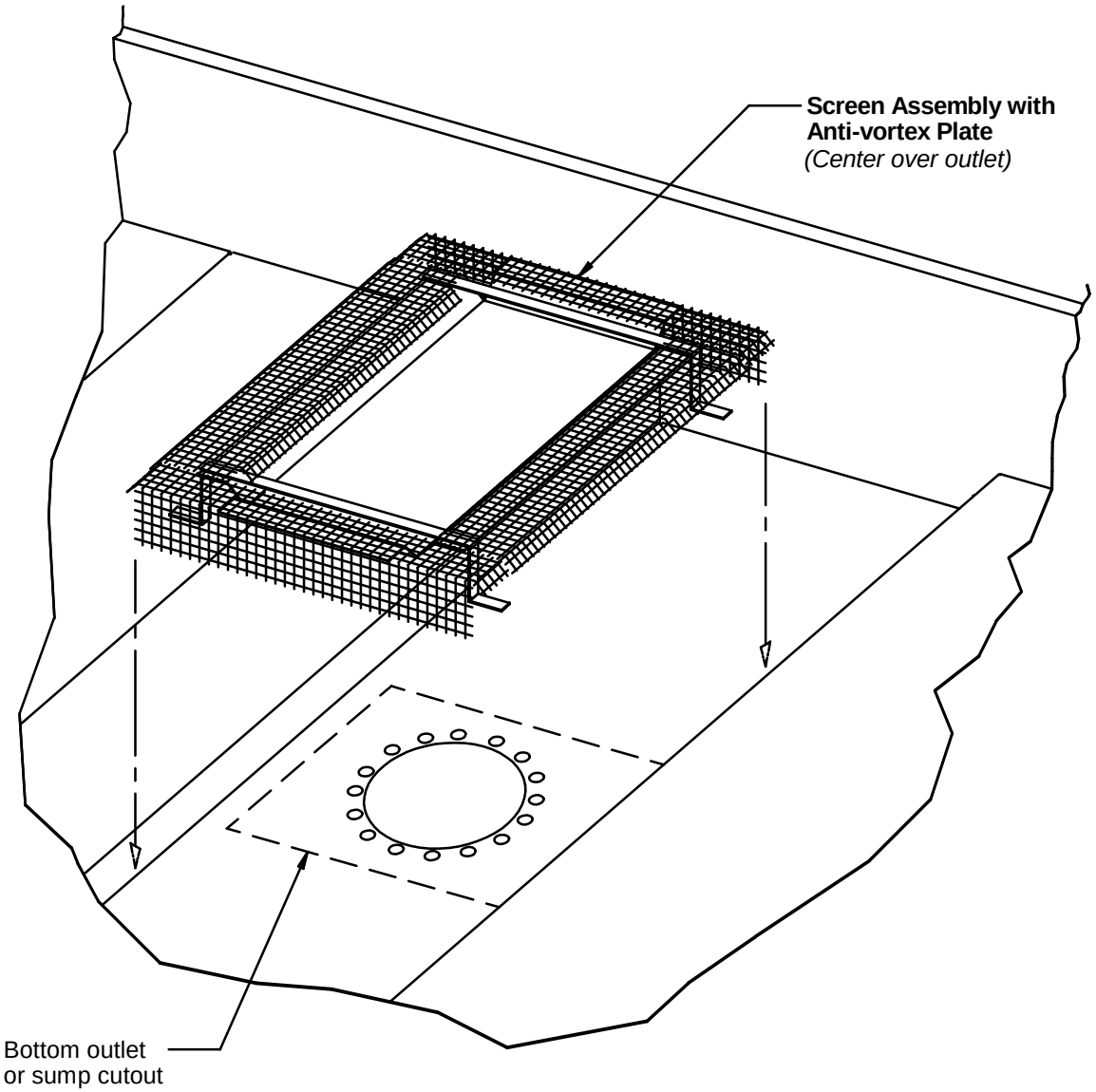
Figure 1

PRELIMINARY

ANTI-VORTEX PLATE

On towers with higher outlet flows, a screen assembly with an anti-vortex plate is used as shown in the figure below. Anti-vortex plate is pre-assembled with screens and retainers. Position anti-vortex assembly in depressed area of collection basin centered over outlet.

FIND NO.	DESCRIPTION
V02	BOLT, 1/4" X 1"
VP3	BOLT, HF 10MM X 25MM
W01	1/4" LOCK WASHER
W21	1/4" FLAT WASHER
X01	NUT, 1/4"
X61	NUT, HF M10



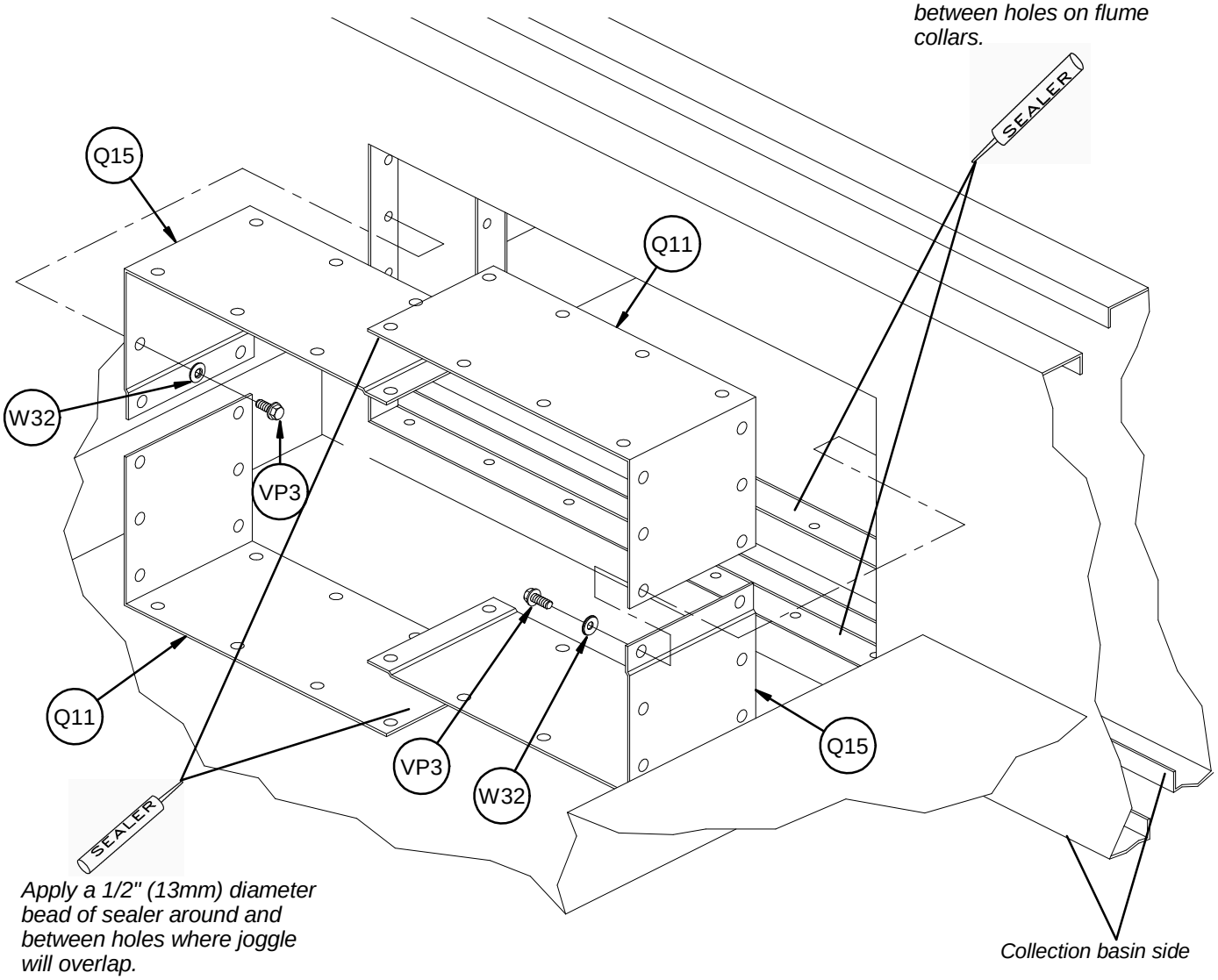
PRELIMINARY

FLUME

If collection basins of multiple towers are to be connected together, a flume is installed per *Figure 1*. Flume collars are shop installed in each tower along with temporary coverplates for shipment. Remove coverplates before continuing. *Note that if a weir gate option (a removable plate used to isolate adjacent towers) has been purchased, the weir gate is shop installed, in one tower, for shipment. The weir gate will be reinstalled, in either tower, after installation of flume per Weir Gate installation instructions.*

IMPORTANT! *Flumes are not a walking surface. Flumes that are 18" (457mm) long and longer have a caution decal which should be oriented on top.*

Note that towers must be aligned before attempting to install flume in place. **Sealing of the flume connections is critical to prevent leaks.** Apply a 1/2" (13mm) bead of sealer **Z11** as indicated, around and between all holes on both flume collars. Install non-joggled flume corners **Q11** first. Apply another bead of sealer around and between holes where joggle will overlap on flume. Compete flume installation by installing joggled flume corners **Q15**. *If weir gate option is purchased, ends of flume corners must be flush to ensure a proper seal.*



FIND NO.	DESCRIPTION
VP3	BOLT, HF 10MM X 25MM
W32	3/8" SEAL WASHER

Fasteners are stainless steel

Figure 1

PRELIMINARY

WEIR GATE

If the weir gate option is being used refer to the above figure for installation details. Slide weir gate **Q16** and gasket **Q19** (removed from tower before flume installation) over eight longer bolts. Tighten all bolts, beginning at the top, compressing gasket against end of flume insert.

FIND NO.	DESCRIPTION
W02	3/8" LOCK WASHER
X02	3/8" NUT
X12	3/8" SELF-LOCKING NUT

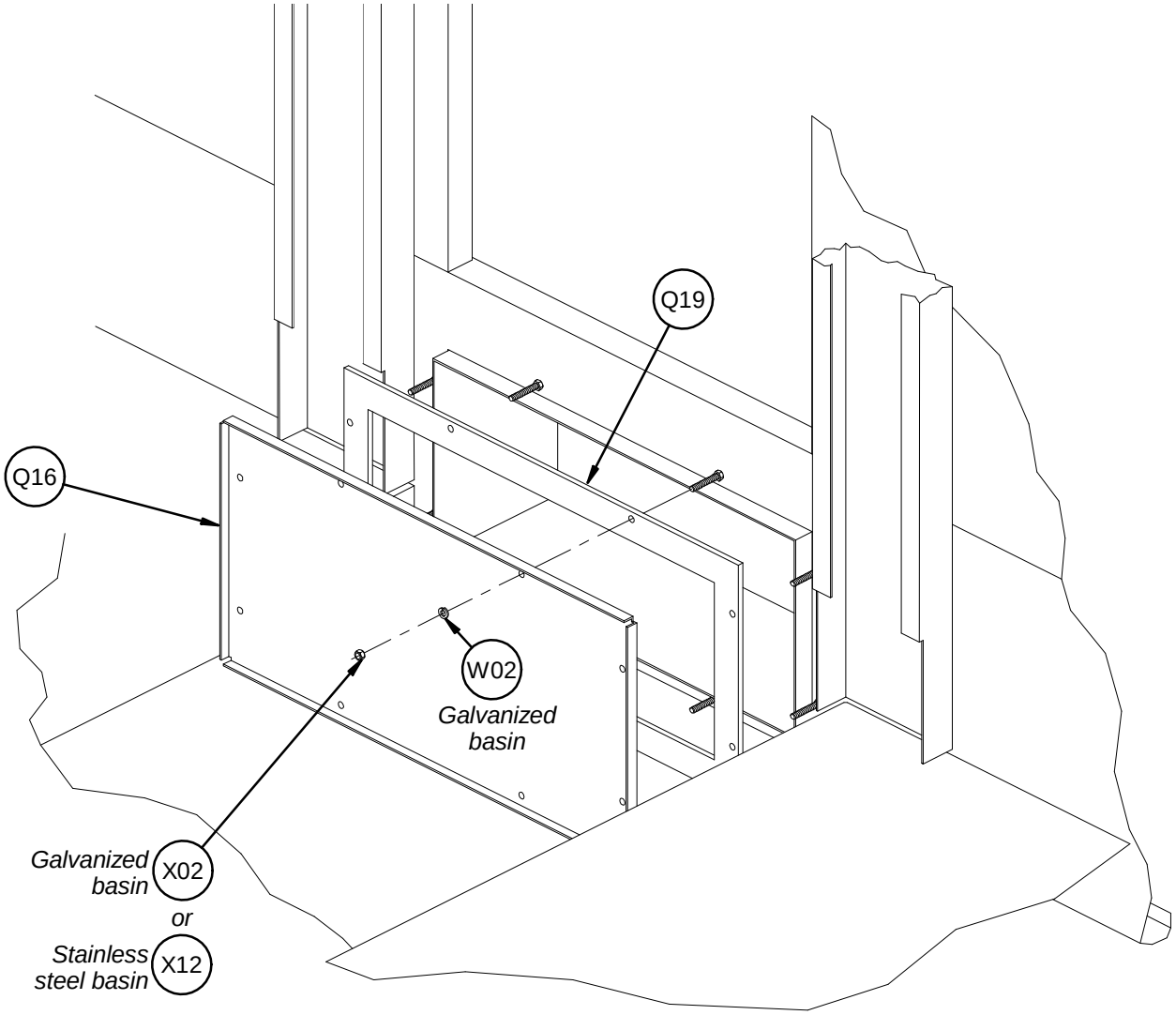


Figure 1

PRELIMINARY

FLOAT VALVE FLOAT

Attach stem **Q29** to float **Q31**. Install float and stem assembly into end of float valve lever arm as shown in *Figure 1*. *See your NC Owners Manual for adjustment of float valve.*

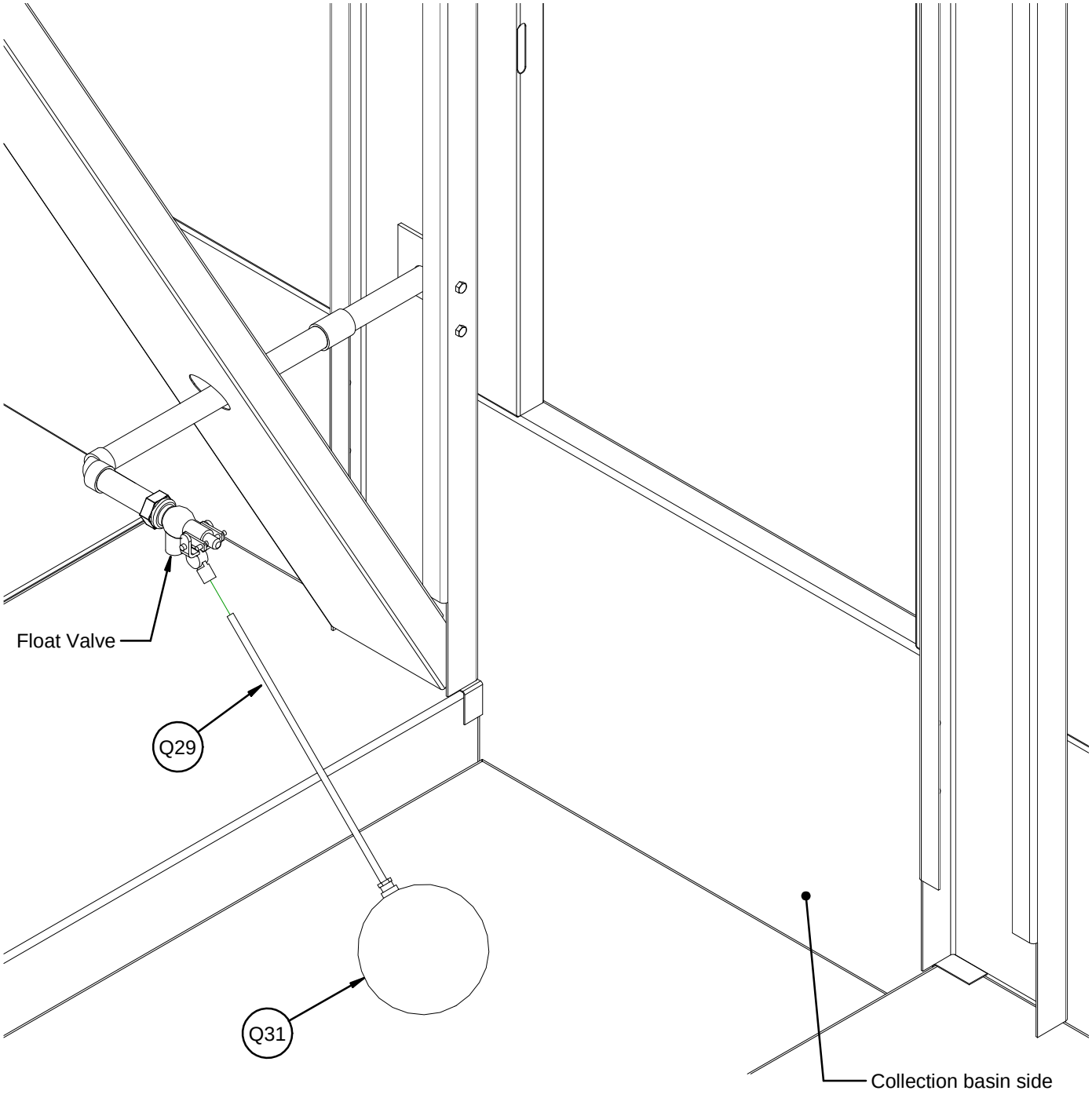


Figure 1

PRELIMINARY

STANDPIPE FLOAT VALVE

Figure 1 shows the standpipe float valve installation. Start by attaching standpipe assembly **Q25** and gasket **Q53** to the collection basin floor. Using pipe joint compound **Z04** on all pipe connections, connect 90° elbow **Q26**, pipe **Q32**, and float valve **Q28** (*make sure valve opening is pointed down*). Install float **Q31** and valve stem **Q29**. Coat exposed pipe threads with rust inhibiting paint. See your *NC Owners Manual* for adjustment of float valve.

FIND NO.	DESCRIPTION
VP0	BOLT, HF 8MM X 25MM
W37	SEALING WASHER - 5/16"
X60	NUT, HF M8

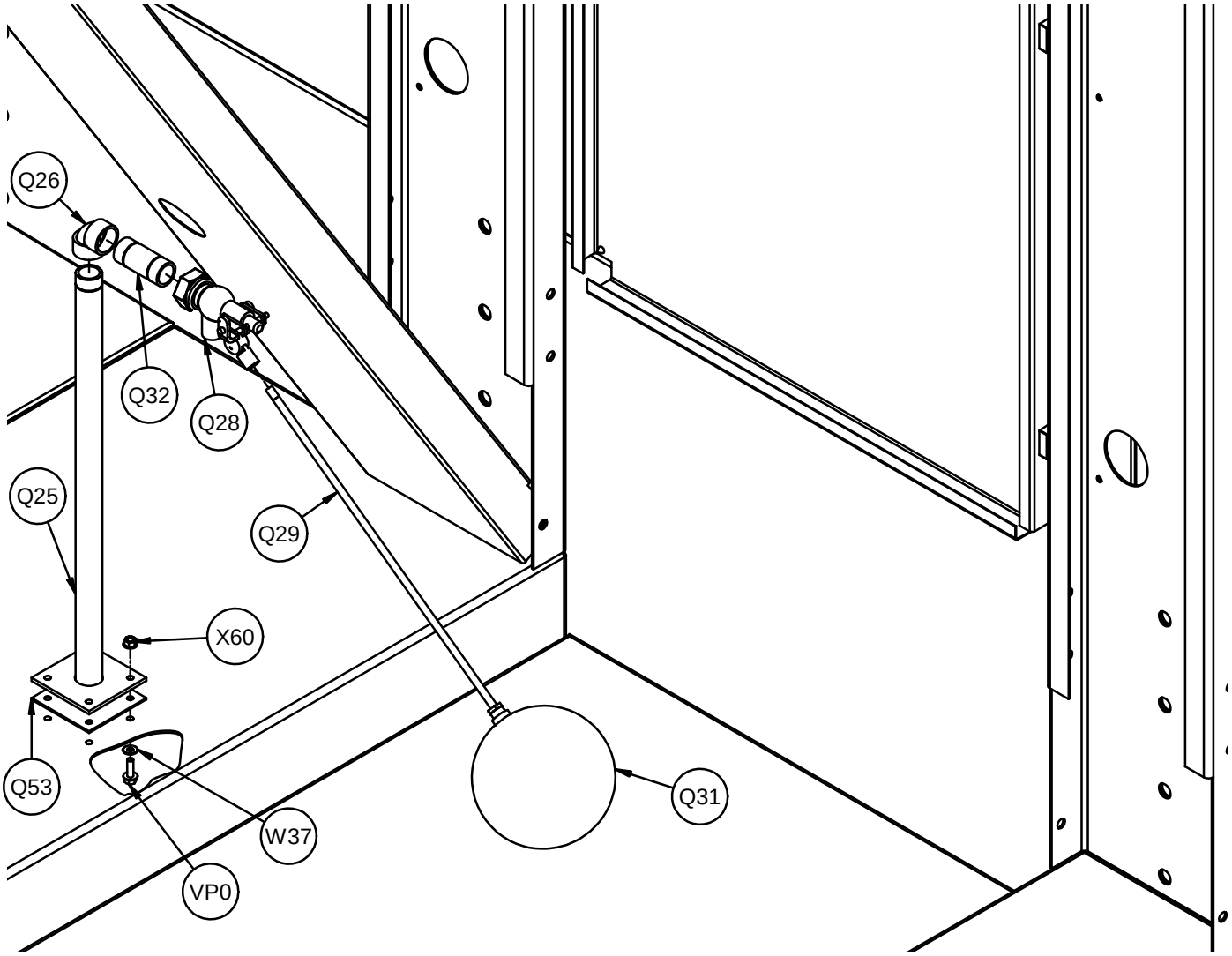


Figure 1

PRELIMINARY

ELECTRIC BASIN HEATERS

The collection basin modifications for the heater components for single cell towers are typically located on a cased face for a single heater element and thru the depressed section floor for multiple heater elements. The collection basin modifications for the heater components for multi-cell towers are typically located thru the collection basin depressed floor. See *Figure 1.* Depending on heater package selected, multiple holes for heater elements may be in basin. The installation must meet requirements of latest National Electric Code and local codes. Heater package components consist of an enclosure, magnetic contactor, circuit board, transformer, heater elements, and control probe. One heater package can control the heaters for a maximum of a two cell multi-cell tower. Multi-cell towers with more than two cells must have a heater package for every two cells, or for every cell.

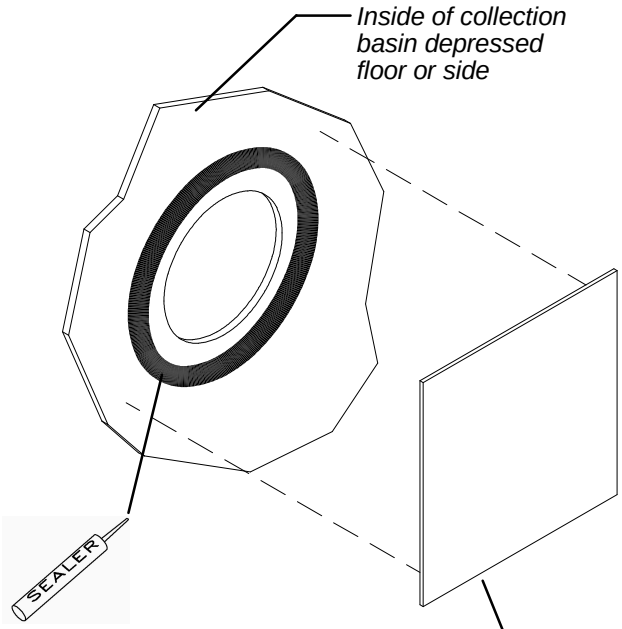


Figure 1

*If the heater is unavailable and it is necessary to run the tower, temporary cover plates **P51** are provided for installation per Figure 1.*

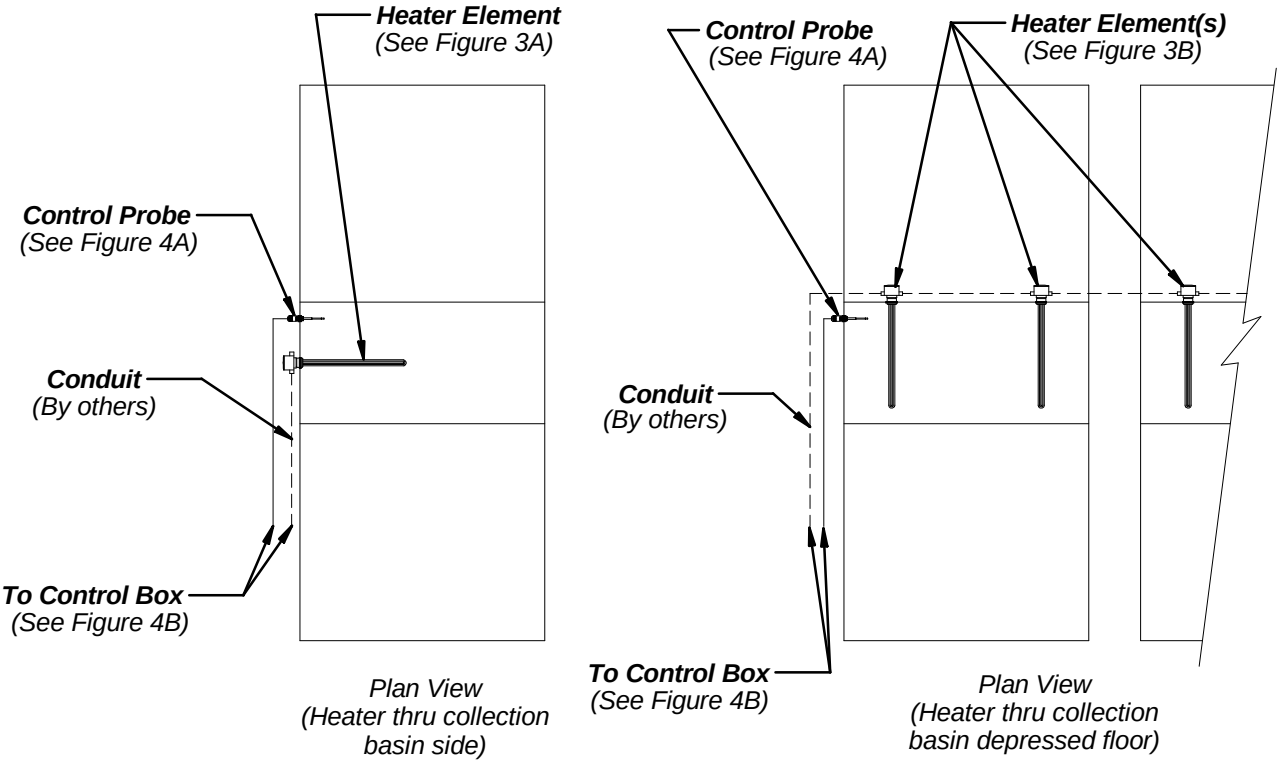


Figure 2

PRELIMINARY

FIND NO.	DESCRIPTION
VP0	BOLT, HF 8MM X 25MM
W37	SEALING WASHER, M8
X60	NUT, HF M8

If heater is located over an equalizer, install the equalizer before installing the heater. Bolt heads of the equalizer fasteners must be on the inside of the basin.

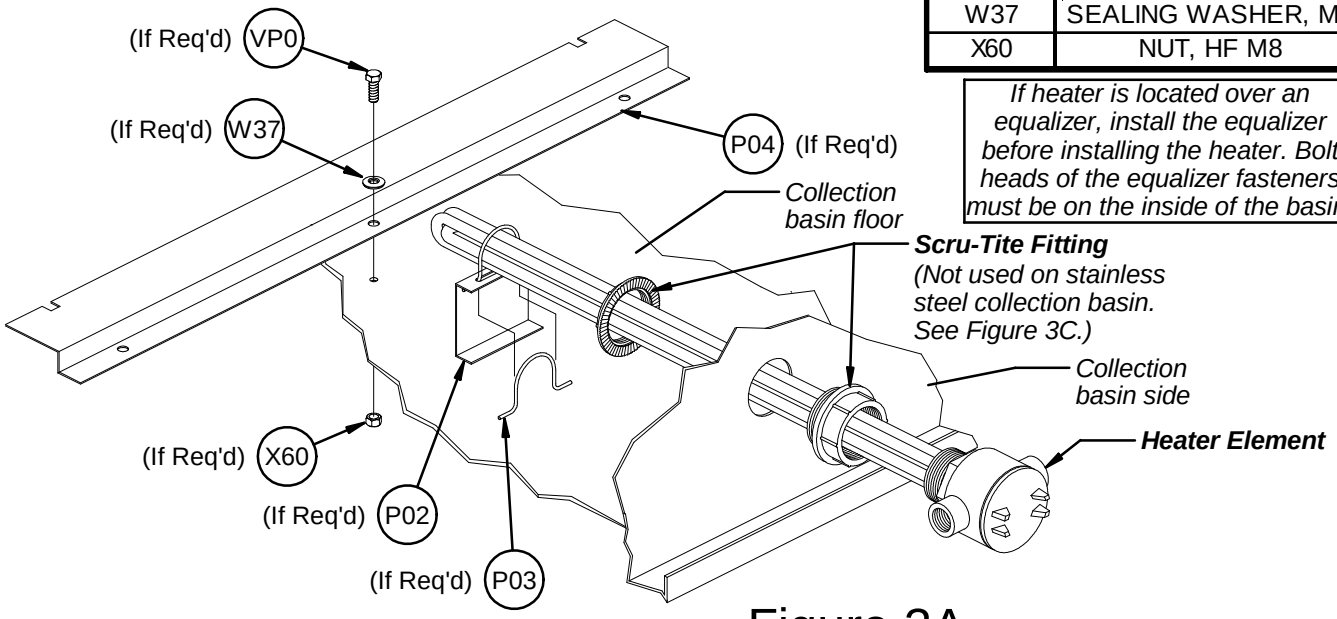


Figure 3A

(Heater thru collection basin side)

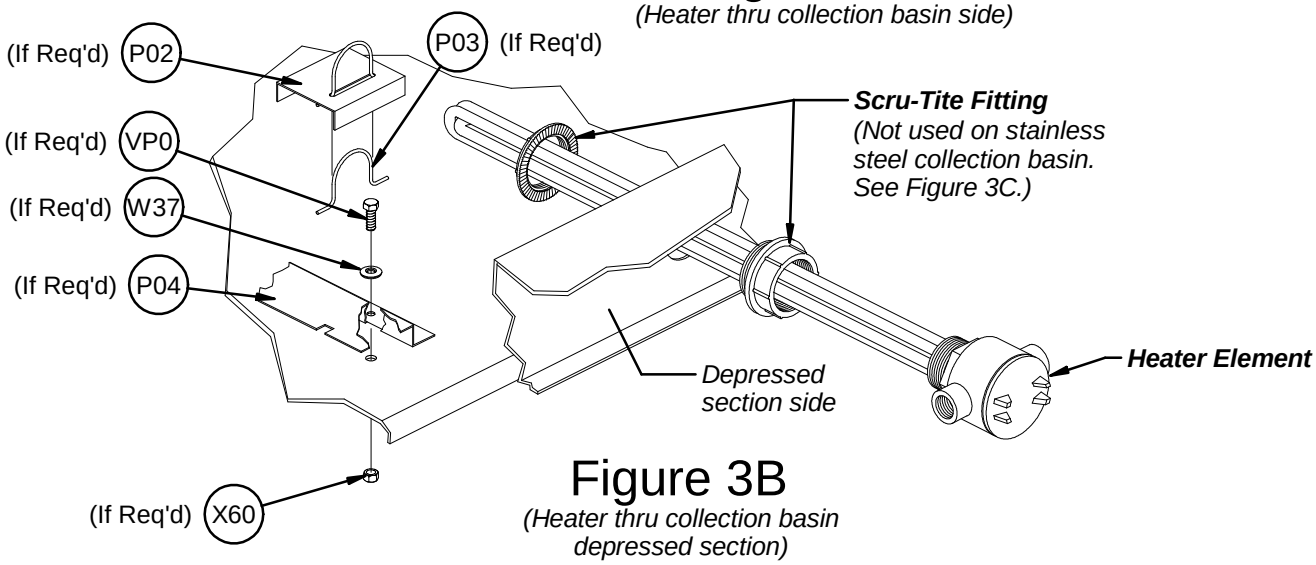


Figure 3B

(Heater thru collection basin depressed section)

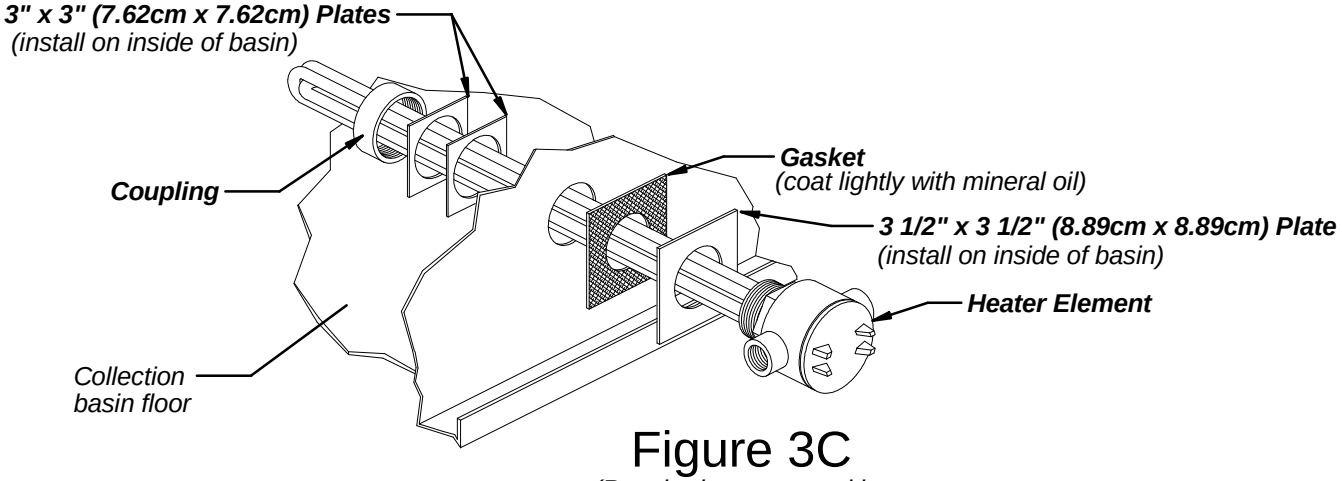

3" x 3" (7.62cm x 7.62cm) Plates
(install on inside of basin)
Coupling
Gasket
(coat lightly with mineral oil)
3 1/2" x 3 1/2" (8.89cm x 8.89cm) Plate
(install on inside of basin)
Heater Element
Collection basin floor

Figure 3C

(Required on towers with stainless steel collection basin)

PRELIMINARY

The heater element(s) are installed in the 2 7/16" (6.19cm) diameter hole(s) in the collection basin. On galvanized basins install scru-tite fitting as shown in *Figures 3A and 3B.* On stainless steel basins install gasket, plates and coupling as indicated in *Figure 3C*. Use pipe joint compound on threads for a watertight connection and screw heater element into fitting or coupling. Plugs are provided in conduit openings of heater element. Install single conduit to opening with temporary plastic plug. *Do not remove pipe plug unless conduit is installed.*

If heater is within ten inches of a grp sump, a heat shield has been provided. Clean area and apply a 3/8" diameter bead of sealer **Z11** around holes. Attach shield **P04** to floor as shown in *Figures 3A and 3B.*

If heater is located over an equalizer, install the equalizer before installing the heater. Bolt heads of the equalizer fasteners must be on the inside of the basin.

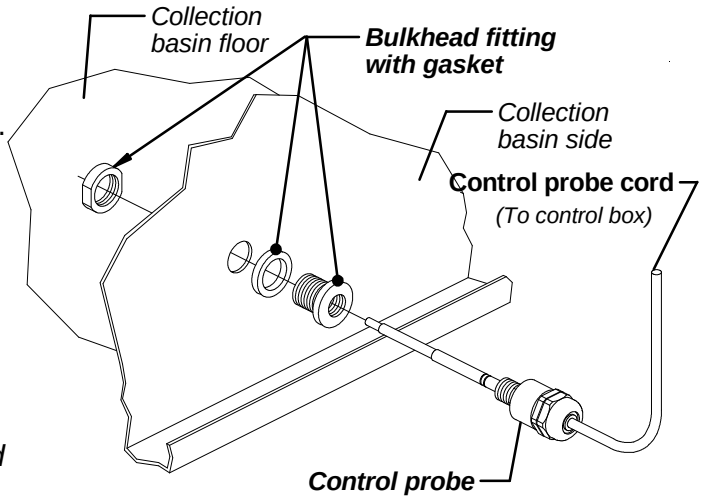


Figure 4A

Install the control probe in the bulkhead fitting as shown in *Figure 4A.* Use pipe joint compounds on threads for a water tight connection. The bulkhead fittings is then installed in the 1 1/8" (2.86cm) diameter hole in the collection basin.

The basin heater control *(Figure 4B)* is to be located and installed by the customer, outside the cooling tower. Control probe cord length of 12'-0" (3.66m) limits control box location.

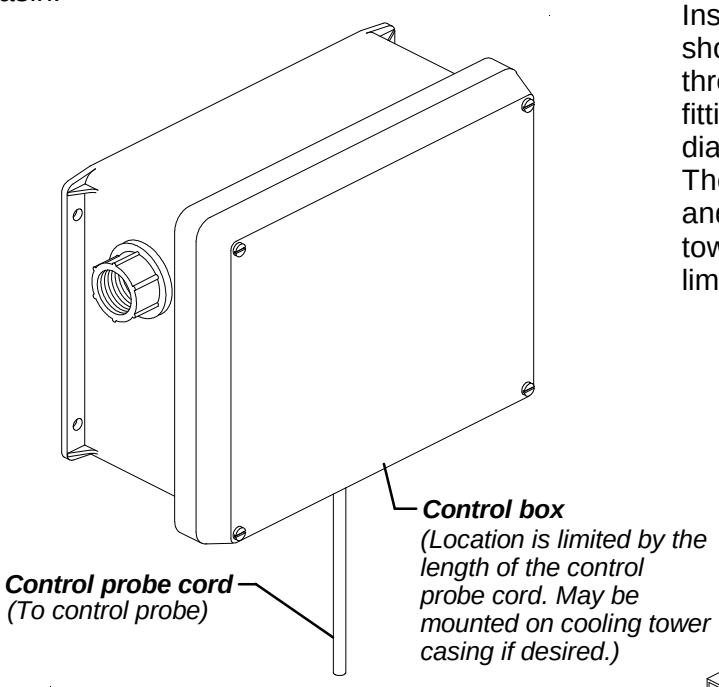

Control box
(Location is limited by the length of the control probe cord. May be mounted on cooling tower casing if desired.)
Control probe cord
(To control probe)

Figure 4B

If the heater element is over 10 kilowatts a heater support is required as shown in *Figure 4C*. Insert formed wire **P03** thru heater support **P02** and slide over the end of the heater element. Position support to keep the unsupported length of the heater element under 30 inces (76.2cm). Clean area under support and "glue" to floor using sealer **Z11**.

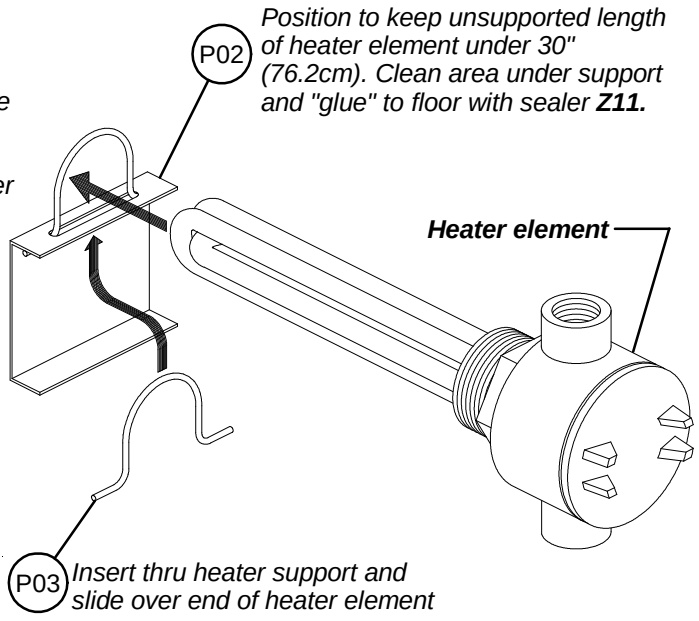

P02
Position to keep unsupported length of heater element under 30" (76.2cm). Clean area under support and "glue" to floor with sealer Z11.
Heater element
P03
Insert thru heater support and slide over end of heater element

Figure 4C

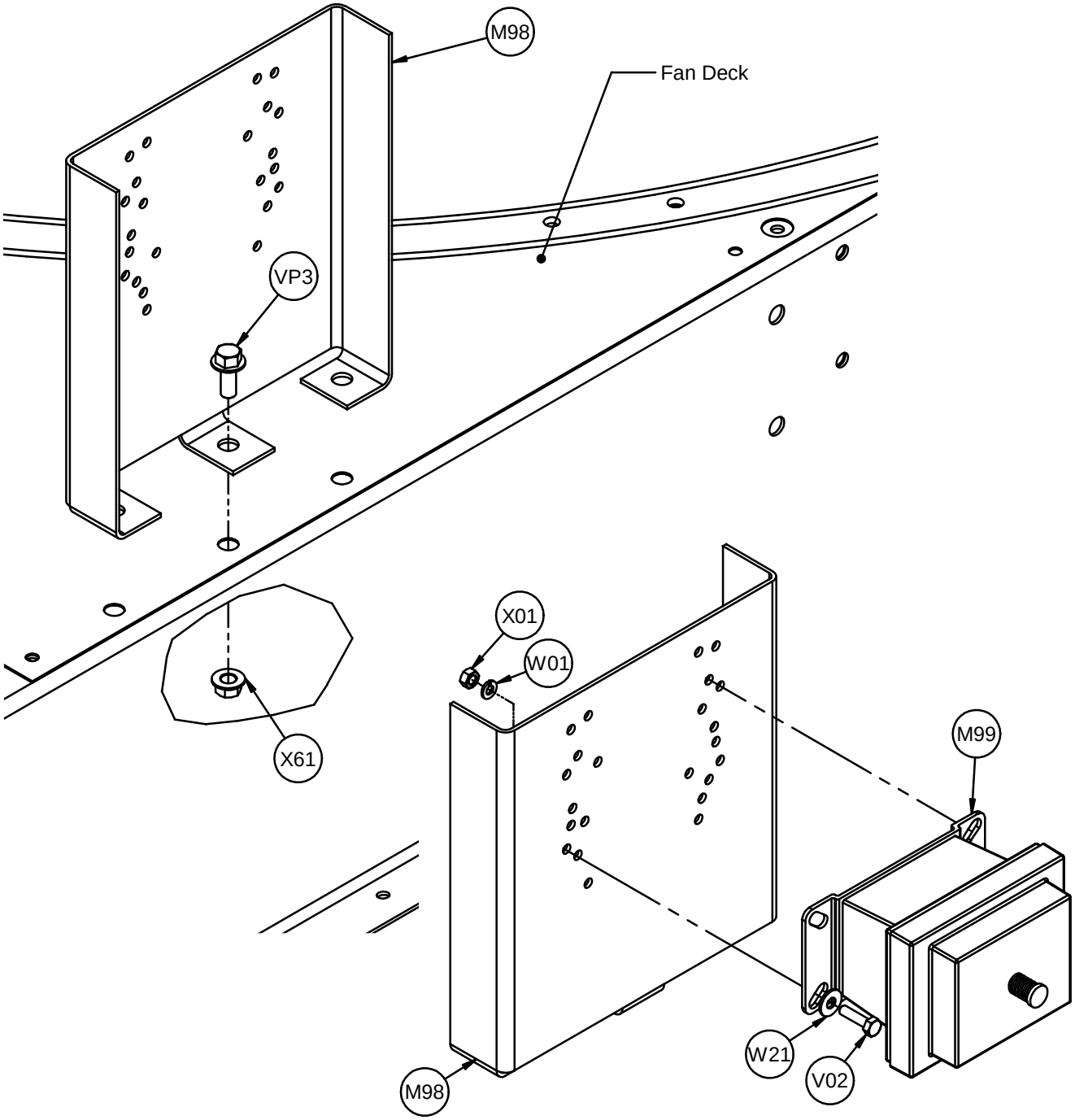
(Required on heaters over 10 kilowatts)

PRELIMINARY

EXTERNAL VIBRATION SWITCH

If your tower is equipped with an external Metrix, Robertshaw, Murphy, or other vibration switch, install bracket **M98** to the fan deck on the motor side of the tower as shown. The bracket may be rotated 180° from position shown on towers without the ladd er and handrail option. Install switch **M99** as shown. If a rainshield is required, it is provided for installation between the beam and the switch using the switch mounting hardware.

FIND NO.	DESCRIPTION
V02	BOLT, 1/4" X 1"
VP3	BOLT, HF 10MM X 25MM
W01	1/4" LOCK WASHER
W21	1/4" FLAT WASHER
X01	NUT, 1/4"
X61	NUT, HF M10



PRELIMINARY

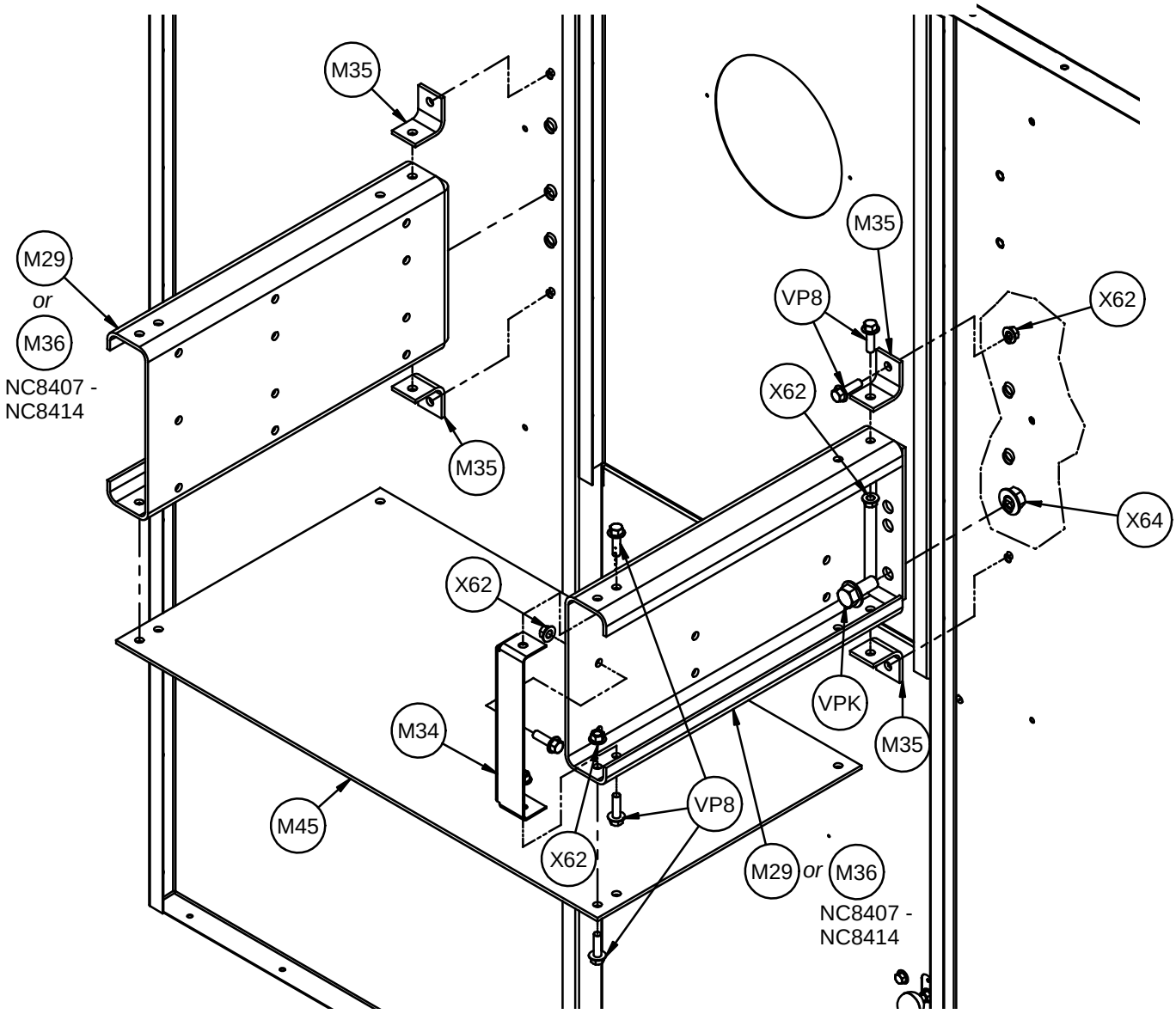


Figure 1

NC8401 thru NC8414

MOTOR OUTSIDE AIRSTREAM (MOA)

On towers with MOA option, the motor must be installed in the field on a special support outside the tower and a driveshaft is used as the drive line between motor and Geareducer.

For models NC8401 thru NC8403 refer to Figure 1. Attach support clips **M35** to support rails **M29** or **M36**. Insert end gusset **M34** into each rail and attach with hardware as shown. Install bottom plate **M45** to the bottom of the support rails. Attach support assembly to the outside of tower as shown.

FIND NO.	DESCRIPTION
VP8	BOLT, HF 12MM X 40MM
VPK	BOLT, HF 20MM X 45MM
X62	NUT, HF M12
X64	NUT, HF M20

PRELIMINARY

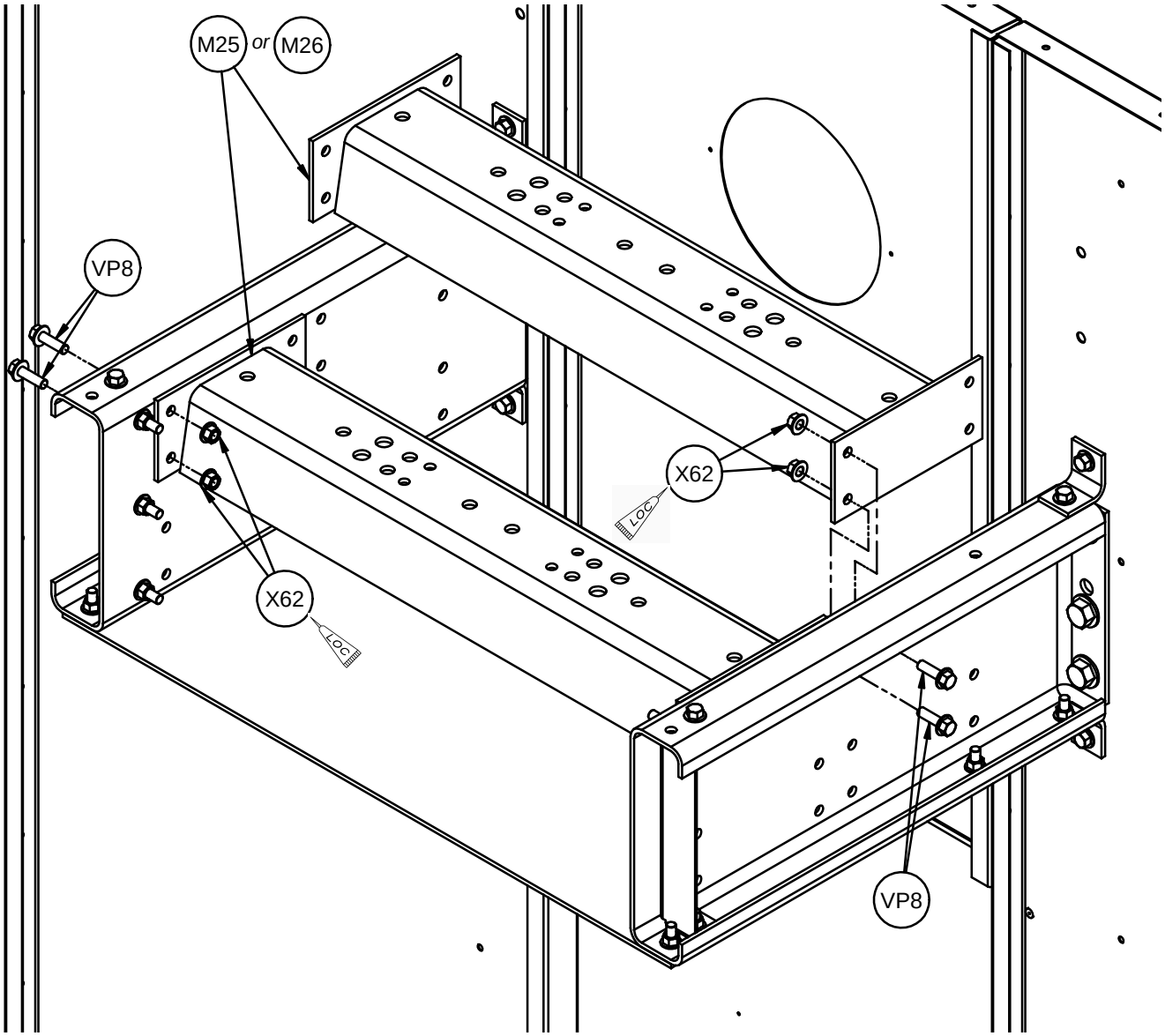


Figure 2

Install motor supports **M25** and/or **M26** as shown above.

FIND NO.	DESCRIPTION
VP8	BOLT, HF 12MM X 40MM
X62	NUT, HF M12

PRELIMINARY

FIND NO.	DESCRIPTION
T06	1/4" x 3/4" TAP SCREW

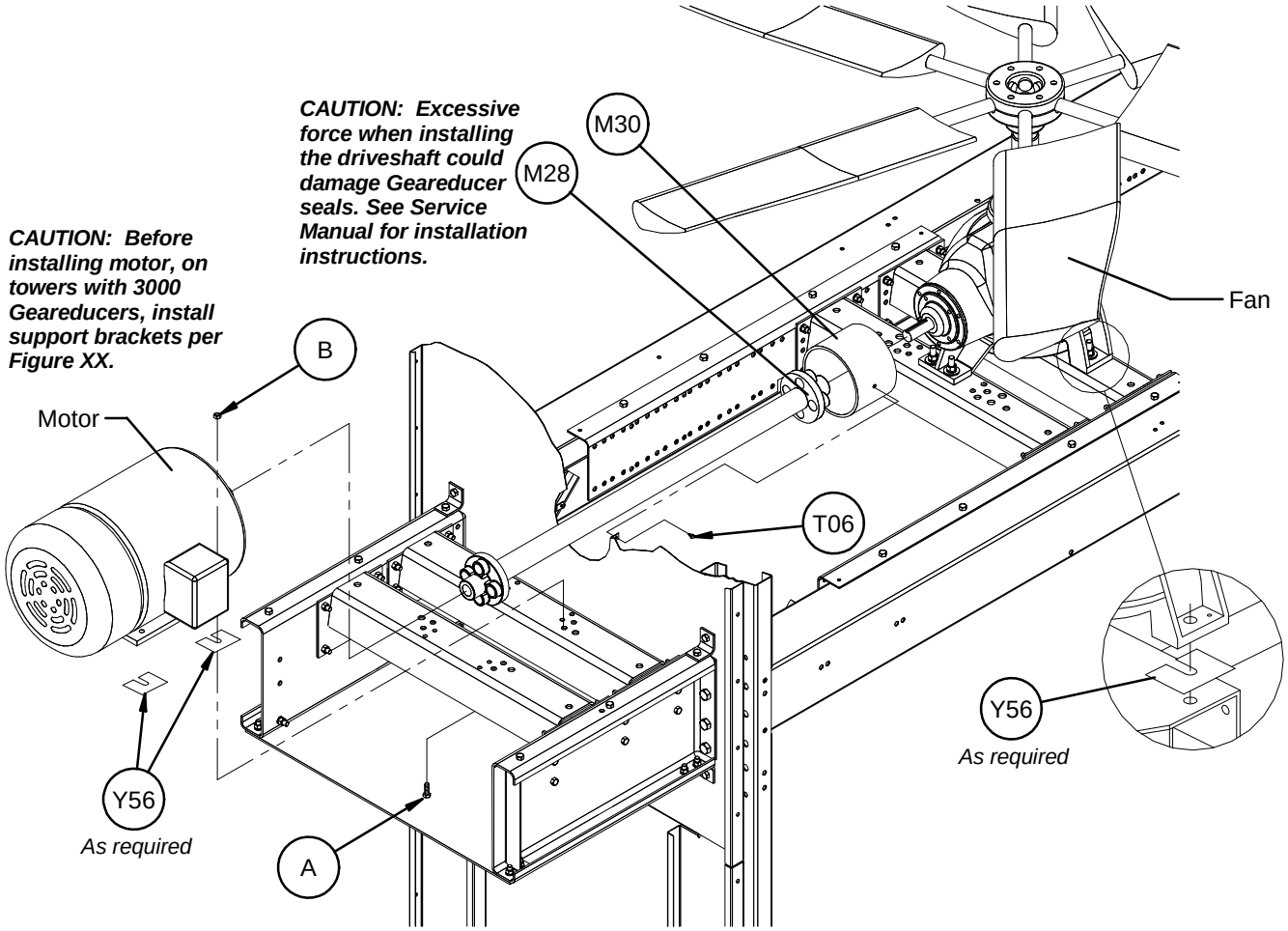


Figure 3

Do not apply anti-seize compounds to stainless steel motor hold down bolts. Loctite will be applied to these attachments later.

MOTOR ATTACHMENT HARDWARE			
MOTOR FRAME	FIND NUMBERS		DESCRIPTION
	A	B	
184T THRU 215T	VP4	X61	BOLT, HF 10MM X 40MM, NUT, HF M10
254T THRU 365T	VPG	X63	BOLT, HF 16MM X 65MM, NUT, HF M16
404T THRU 447T	VPN	X64	BOLT, HF 20MM X 90MM, NUT, HF M20
449T	VPL	X64	BOLT, HF 20MM X 65MM, NUT, HF M20

Attach motor to motor supports. Coat motor shaft, Geareducer shaft and bores of driveshaft yokes with lubricant **Z21**. Slide driveshaft guard **M30** around driveshaft **M28** and install per Driveshaft Service Manual. Use shims **Y56**, as required, to align driveshaft.

After installing driveshaft, coat motor and Geareducer shafts with paint. Slide guard thru hole in casing against motor and use guard clips as templates to drill (2) 3/16" (5mm) dia. holes in guard and attach to clips.

PRELIMINARY

FAN INSTALLATION

Step One (NC8401 thru NC8414)

On towers with field install motor, final fan adjustments must be made after motor is in place. Fan blades are pitched to contract requirements in the plant. Fan blade tip clearance, tip track, and fan tilt must be adjusted in the field, as indicated in *Figure 4*. Tower must be plumb and cylinder centered around fan to provide proper tip clearance. Use longest blade and check all around cylinder for tip clearance. Be certain each blade is in its furthest out position.

Tower Model	A
NC8401	1/2" (13mm)
NC8402	1/2" (13mm)
NC8403	1/2" (13mm)
NC8405	1/2" (13mm)
NC8407	1/2" (13mm)
NC8409	1/2" (13mm)
NC8411	1/2" (13mm)
NC8412	1/2" (13mm)
NC8413	1/2" (13mm)
NC8414	1/2" (13mm)

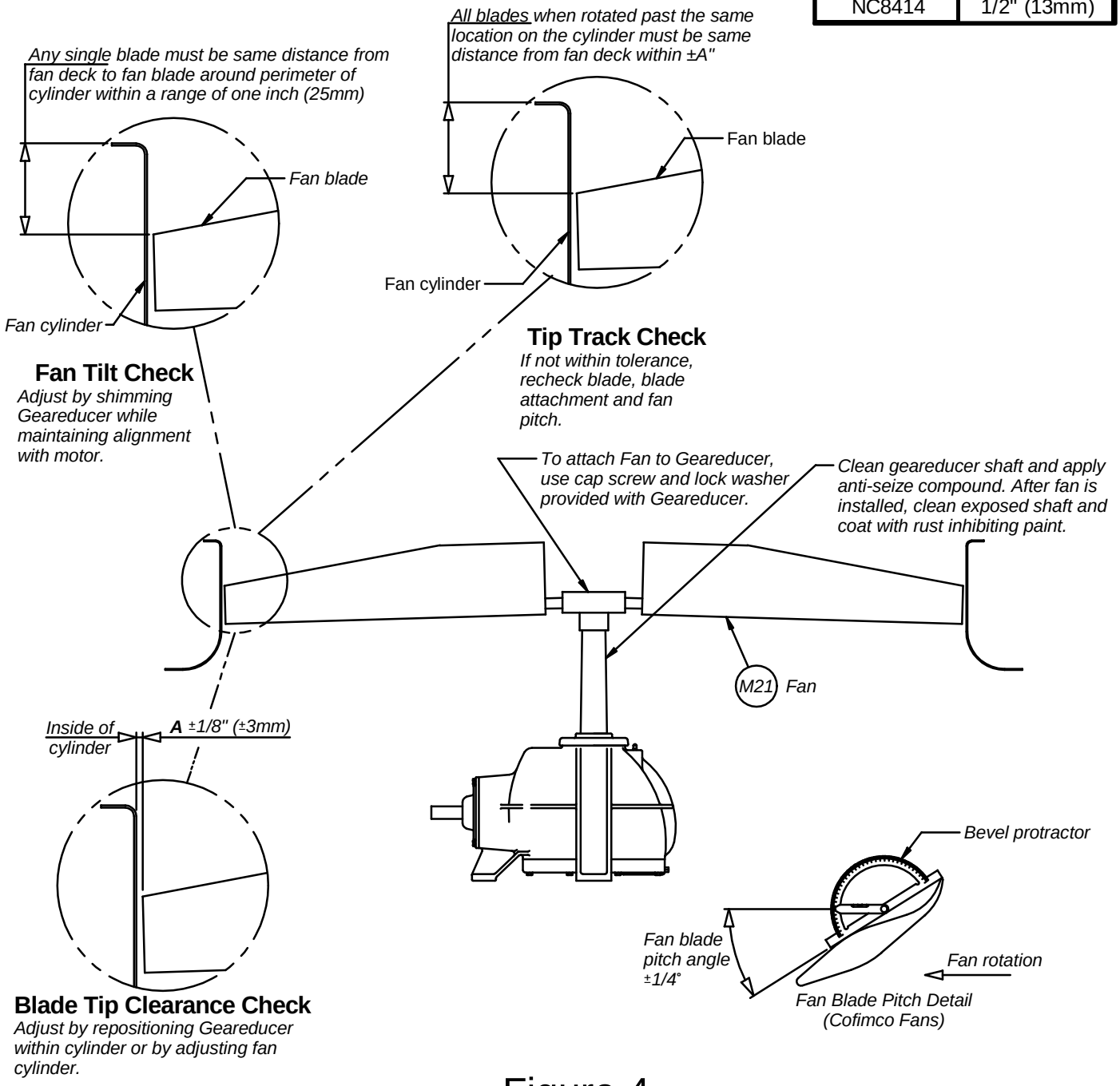

Any single blade must be same distance from fan deck to fan blade around perimeter of cylinder within a range of one inch (25mm)
Fan blade
Fan cylinder
Fan Tilt Check
Adjust by shimming Geareducer while maintaining alignment with motor.
All blades when rotated past the same location on the cylinder must be same distance from fan deck within ±A"
Fan blade
Fan cylinder
Tip Track Check
If not within tolerance, recheck blade, blade attachment and fan pitch.
To attach Fan to Geareducer, use cap screw and lock washer provided with Geareducer.
Clean geareducer shaft and apply anti-seize compound. After fan is installed, clean exposed shaft and coat with rust inhibiting paint.
M21 Fan
Inside of cylinder
A ±1/8" (±3mm)
Blade Tip Clearance Check
Adjust by repositioning Geareducer within cylinder or by adjusting fan cylinder.
Bevel protractor
Fan blade pitch angle ±1/4˚
Fan rotation
Fan Blade Pitch Detail (Cofimco Fans)

Figure 4

PRELIMINARY

FIND NO.	DESCRIPTION
Y55	3/8" X 1 1/2" SPIROL PIN

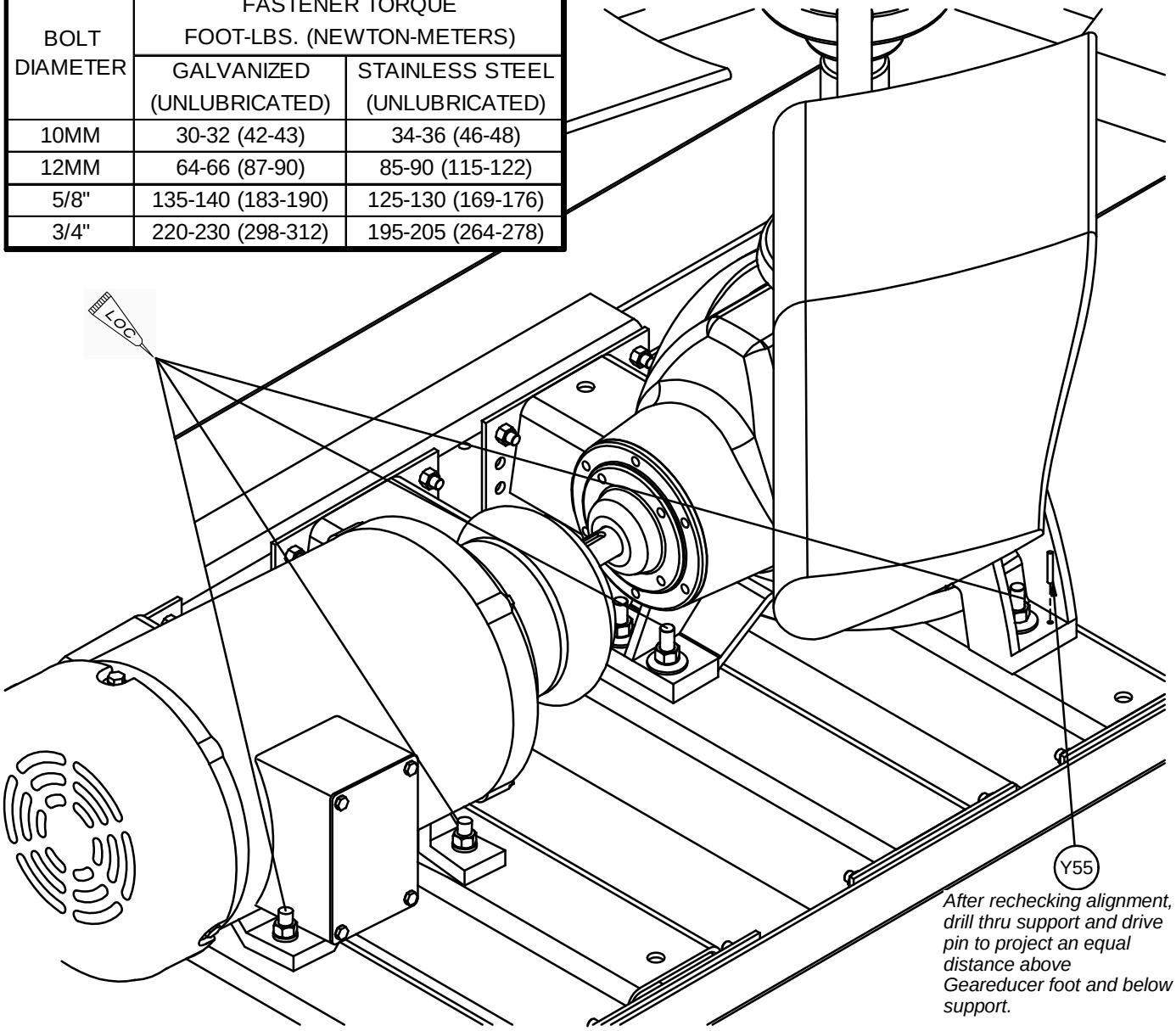
FAN INSTALLATION

Step Two (NC8401 thru NC8414)

After all drive coupling and fan adjustments have been made refer to *Figure 5*. Tighten each motor and Geareducer nut 5 to 10 ft-lbs (7 to 13 Nm) less than specified torque while holding bolt head. Retighten nuts to specified torque. Bolt heads may be tightened while holding nut if nut is not accessible with torque wrench. Now apply thread locking compound **Z05** to all bolt threads. On towers with series 2000, 2200, 2400, or 3000 Geareducers, using pilot holes in Geareducer feet, drill two 23/64" (9mm) diameter holes through support and install drive pins Y55.

FASTENER TORQUE @ MOTOR AND GEAREDUCER HOLD-DOWN FASTENERS ONLY

BOLT DIAMETER	FASTENER TORQUE FOOT-LBS. (NEWTON-METERS)	
	GALVANIZED (UNLUBRICATED)	STAINLESS STEEL (UNLUBRICATED)
10MM	30-32 (42-43)	34-36 (46-48)
12MM	64-66 (87-90)	85-90 (115-122)
5/8"	135-140 (183-190)	125-130 (169-176)
3/4"	220-230 (298-312)	195-205 (264-278)



After rechecking alignment, drill thru support and drive pin to project an equal distance above Geareducer foot and below support.

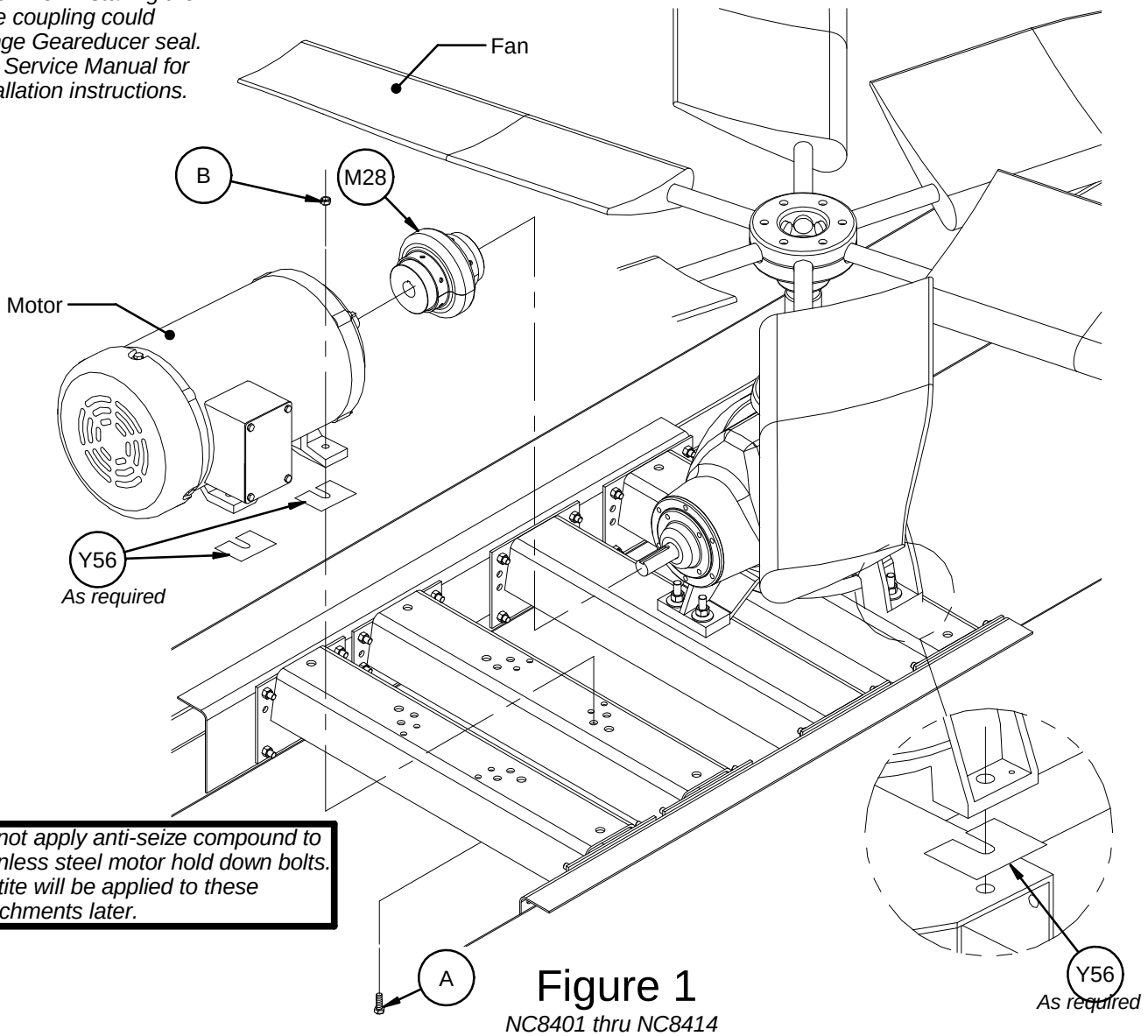
PRELIMINARY

FIELD INSTALLED MOTOR

For field installation of motor inside the tower refer to *Figure 1*. Attach motor to motor supports and install drive coupling **M28**. Refer to Close Coupling Service Manual for installation instructions. Use shims **Y56** as required, to align drive coupling. After installing drive coupling, coat motor and Geareducer shafts with paint.

FIND NO.	DESCRIPTION
VP8	BOLT, HF 12MM X 40MM
VPK	BOLT, HF 20MM X 45MM
X62	NUT, HF M12
X64	NUT, HF M20

CAUTION: *Excessive force when installing the drive coupling could damge Geareducer seal. See Service Manual for installation instructions.*



Do not apply anti-seize compound to stainless steel motor hold down bolts. Loctite will be applied to these attachments later.

Figure 1

NC8401 thru NC8414

MOTOR ATTACHMENT HARDWARE			
MOTOR FRAME	FIND NUMBERS		DESCRIPTION
	A	B	
184T THRU 215T	VP4	X61	BOLT, HF 10MM X 40MM, NUT, HF M10
254T THRU 365T	VPG	X63	BOLT, HF 16MM X 65MM, NUT, HF M16
404T THRU 447T	VPN	X64	BOLT, HF 20MM X 90MM, NUT, HF M20
449T	VPL	X64	BOLT, HF 20MM X 65MM, NUT, HF M20

PRELIMINARY

FAN INSTALLATION

Step One (NC8401 thru NC8414)

On towers with field install motor, final fan adjustments must be made after motor is in place. Fan blades are pitched to contract requirements in the plant. Fan blade tip clearance, tip track, and fan tilt must be adjusted in the field, as indicated in *Figure 4*. Tower must be plumb and cylinder centered around fan to provide proper tip clearance. Use longest blade and check all around cylinder for tip clearance. Be certain each blade is in its furthest out position.

Tower Model	A
NC8401	1/2" (13mm)
NC8402	1/2" (13mm)
NC8403	1/2" (13mm)
NC8405	1/2" (13mm)
NC8407	1/2" (13mm)
NC8409	1/2" (13mm)
NC8411	1/2" (13mm)
NC8412	1/2" (13mm)
NC8413	1/2" (13mm)
NC8414	1/2" (13mm)

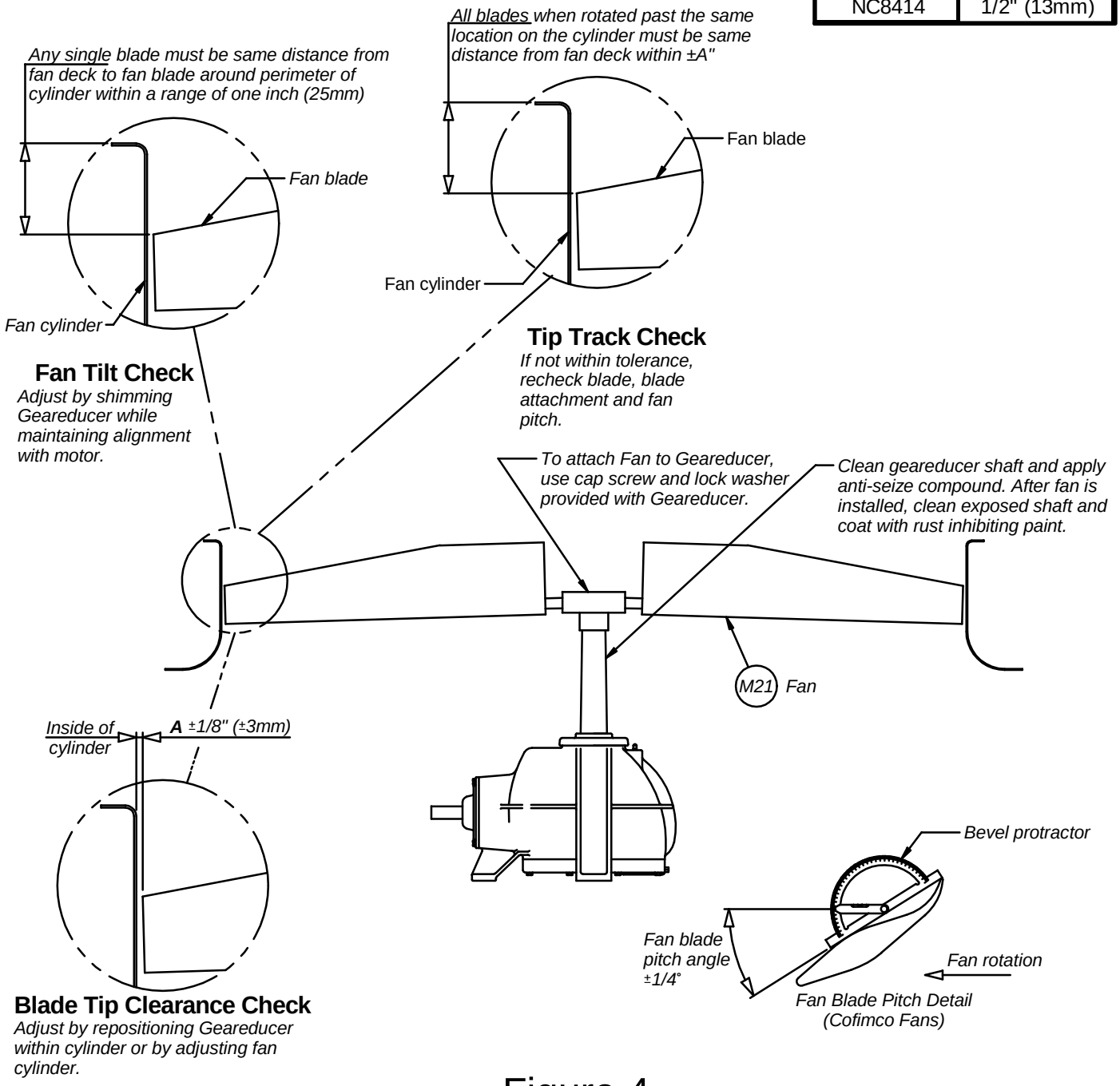

Any single blade must be same distance from fan deck to fan blade around perimeter of cylinder within a range of one inch (25mm)
Fan blade
Fan cylinder
Fan Tilt Check
Adjust by shimming Geareducer while maintaining alignment with motor.
All blades when rotated past the same location on the cylinder must be same distance from fan deck within ±A"
Fan blade
Fan cylinder
Tip Track Check
If not within tolerance, recheck blade, blade attachment and fan pitch.
To attach Fan to Geareducer, use cap screw and lock washer provided with Geareducer.
Clean geareducer shaft and apply anti-seize compound. After fan is installed, clean exposed shaft and coat with rust inhibiting paint.
M21 Fan
Inside of cylinder
A ±1/8" (±3mm)
Blade Tip Clearance Check
Adjust by repositioning Geareducer within cylinder or by adjusting fan cylinder.
Bevel protractor
Fan blade pitch angle ±1/4˚
Fan rotation
Fan Blade Pitch Detail (Cofimco Fans)

Figure 4

PRELIMINARY

FIND NO.	DESCRIPTION
Y55	3/8" X 1 1/2" SPIROL PIN

FAN INSTALLATION

Step Two (NC8401 thru NC8414)

After all drive coupling and fan adjustments have been made refer to *Figure 5*. Tighten each motor and Geareducer nut 5 to 10 ft-lbs (7 to 13 Nm) less than specified torque while holding bolt head. Retighten nuts to specified torque. Bolt heads may be tightened while holding nut if nut is not accessible with torque wrench. Now apply thread locking compound **Z05** to all bolt threads. On towers with series 2000, 2200, 2400, or 3000 Geareducers, using pilot holes in Geareducer feet, drill two 23/64" (9mm) diameter holes through support and install drive pins Y55.

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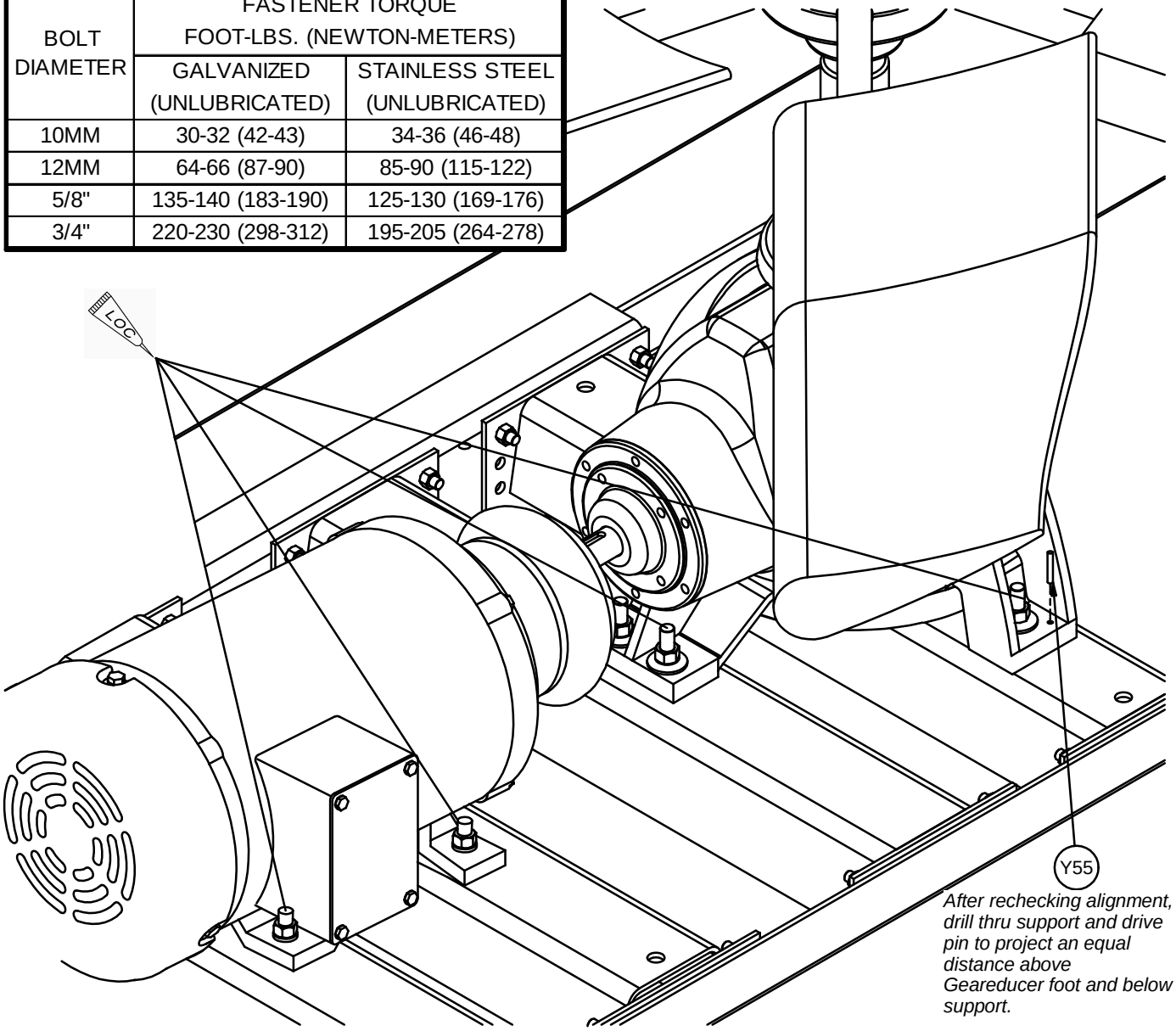

After rechecking alignment, drill thru support and drive pin to project an equal distance above Geareducer foot and below support.